RAILROAD GAZETTE

FRIDAY, AUGUST 11, 1876.

On Bessemer Steel Rails and Their Treatment.

Among the questions reported on in 1874 at the technical convention of the German Railroad Union was the following:

"What has been the recent experience with regard to Bessemer steel rails, especially concerning joints?"

Mr. W. Windschied, Engineer of the Cologne & Minden Railroad, was appointed by the directors of that company to prepare a report on that company's experience with Bessemer rails, and his report is published in the *Organ fuer die Fortschritte des Eisenbahnwesens*. The first part of this report gives the history of the experiments with the different kinds of steel for rails previous to the invention of the Bessemer process, and of the early experience with Bessemer rails. Omitting this, we translate as follows:

The greatest objection which any one has ventured to make against Bessemer rails is that the material is *not ductile enough*, that in consequence of this the rails break too easily, and that, especially in winter when there is severe frost, there is danger of their failing. The author can assert that of his own knowledge no Bessemer rail has ever failed in consequence of frost on the Cologne & Minden Railroad. It is a fact that many breakages have occurred, especially in the unloading of Bessemer rails. Now because the iron and other rails employed hitherto seldom break in unloading, yet we are not justified in holding these rails to be better than Bessemer rails. It only follows that the steel must be treated differently from common iron.

There is no question but that in the great majority of these breakages it is not the behavior of the steel, but rather the improper and careless treatment of it in heating, in rolling, in fitting, and later in transporting and laying that is at fault. The grounds for this opinion are given below. We will only remark here that Bessemer steel, just like iron and puddled steel, has one very dangerous enemy, namely *phosphorus*, when it is present in considerable quantity.

It is a fact well-known, especially to ironmasters, that for the production of a good fine-grained iron and of puddled steel a mild pig iron as free as possible from phosphorus, copper and sulphur is requisite, since these substances make the iron and steel brittle and "short."

In like manner, up to this time only a pig iron smelted from mild ores—that is, such as contain the above-mentioned substances only in small quantity—can be used for making Bessemer steel. A large proportion of manganese, such as is contained by the pig iron of the George-Mary forge and from Steiermark, is advantageous for the production of Bessemer steel. No iron or steel is absolutely free from phosphorus, therefore no reasonable engineer will maintain that a slight admixture of phosphorus must inevitably result in the breaking of Bessemer steel rails; on the contrary, these rails will last quite well in the track if no other circumstances contribute towards causing them to break. The Bessemer steel, for example, suffers by the burning of the rail ingot in the heating furnace; by being rolled too cold; by incautious treatment in fitting; by being violently thrown about and unloaded, etc. On the other hand it must be mentioned that iron rails which are made of too phosphoric, cold-short iron also *commonly* suffer breakages in unloading and on the track, although they exhibit no defect outwardly.

Another objection made to the Bessemer rails is that it is not possible to smelt a material which is always uniform, that it may happen that a soft and therefore ductile rail may chance to lie next to hard and brittle ones, and that therefore there will be an unequal wear of the rails.

By attentively observing the process at each separate charge, also with the aid of the spectroscope, by repeatedly taking test samples of steel and slag from the converter, so many tests have been obtained that even an intelligent workman in a short time forms an accurate judgment concerning the degree of hardness and the properties of the steel produced even while still fluid. If in addition a larger sample of each charge is immediately forged, the hardness of the steel is then positively determined. The limits of the degree of hardness most suitable for the manufacture of rails are now known to every establishment, and it is evident that the manufacturer does not use for rail-making a steel which is not proper for that purpose.

Experience has taught us then that in no kind of rails has there been or is there a more uniform and slighter wear than in Bessemer rails, and therefore the fear of an unequal material has been without foundation in the case of Bessemer rails.

Other disadvantages mentioned above, such as burning, rolling cold, etc., which may cause the breaking of the rails, occur not unseldom; yet all works, having recognized the danger of all these defects, have endeavored as far as possible to obviate them by better arrangements of the furnaces, the converters, the trains of rolls and other apparatus for working.

The raw material for the Bessemer process was obtained from England by Bessemer, and by those German works which first made Bessemer steel. German industry, however, has earnestly endeavored to become independent of foreigners with regard to the raw material, and to smelt in German blast furnaces the brands necessary for making Bessemer metal. The numerous and extensive Bessemer works established are in condition to supply the quantities required by the railroads, and when prices of raw materials and wages of labor have gone back to a normal standard, and we are in condition to produce a very good Bessemer steel for rail-making at the cheapest possible price, Bessemer rails will drive from the field *all other rails*, whether they be iron, fine-grained, or puddled steel rails, and however carefully they may be manufactured.

As early as the year 1864, the Cologne & Minden Railroad ordered Bessemer steel rails for trial from several works, to wit.:

1. From F. Krupp, of Essen	150 rails, 18 ft. long
2. From E. Hoesch & Sons, of Dueren	150 rails, 18 ft. long
3. From the Hoerde Mining and Iron Co., of Hoerde	150 rails, 18 ft. long

These rails were rolled of the Cologne & Minden Railroad's "Caliber IV." (pear-shaped section), which makes a very bad fish joint, on which account it has turned out that after a time the joints of these rails proved much too weak.

The rails ordered from Krupp, whose rail-rolling mill was not yet ready at that time, were rolled at the works of C. Ruetz & Co., at Rotherde, near Dortmund. The ingots for the Hoesch rails were supplied by Poensgen, of Eifel, and they were rolled at Lendersdorf. As early as at the time of receiving these rails the author called attention to the danger of notching the rails, and on his suggestion Bessemer rails thereafter were notched no more. All the rails mentioned above were delivered at Oberhausen, and, on unloading, two of Krupp's rails and one of Hoesch's broke, and all of them exactly at one of the sharp corners of the notch. Rails not notched were not broken. In consequence of this all rails, especially the notched ones, were subjected to a test by being placed in a side-track and supported only by a tie at each end and one in the middle, so that thus between every two ties nine feet apart there was one notch unsupported in the middle. Thereupon the heaviest locomotive at hand was run repeatedly back and forth over the rails. The rails showed under this test a considerable deflection, but none of them broke. Moreover several rails were tested under the hydraulic press, without breaking. Finally the writer had a number of rails thrown from the car down upon the paving stones of a road crossing; not a single one broke, but, it is worth noticing that one broke on reloading them. This rail, however, had experienced an internal strain by the previously described tests, which must have resulted in fracture in any at all severe shock.

After the rails had withstood these tests, 147 of the Krupp, 149 of the Hoesch and 150 of the Hoerde rails were laid in the two main tracks from the Oberhausen station to Brueckthor, which there have a continuous curve of 6,000 feet radius with a grade of 13 feet to the mile, and on which there is a constant and active traffic. With these Bessemer rails were laid: 12 of Hoesch's puddled-steel rails, 12 Funke & Elbers puddled-steel rails, 48 fine-grained steel rails from the Frederick William Forge at Troisdorf, and 48 cemented rails from the Phœnix Works at Ruhrort, half of each kind in each track. Of all these rails there are now still lying, after ten years, all of the Bessemer rails with the exception of a single one of Hoerde's, which we were obliged to remove last year because it was broken in the bolt holes. It should be noted that in these rails the holes were punched, not drilled.

All the rest of the Bessemer rails are still entirely good and uninjured. Only one Hoerde rail in the second track showed, after the first year, a longitudinal fissure not far from a foot long on the middle of the top of the head, which grew broader as time elapsed, so that it appeared as if the rail would split through the whole head. In time, however, a scale about ½ in. thick detached itself on the inner side of the track, probably in consequence of an air bubble situated in this place.

The writer had this scale cut off in 1868 and the rail turned around, so that the damaged edge came on the outside; and this rail lies in the track to-day without any scaling on the other side of the head, or the rail's showing the slightest further defect.

Of the other rails laid with these Bessemer rails, in ten years' time there had been removed and damaged: 3 Hoesch puddled rails, or 25 per cent.; 4 Funke & Elbers puddled rails, or 33⅓ per cent.; 22 fine-grained steel rails from the Frederick William Works, or 46 per cent.; and 14 Phœnix cemented rails, or 29 per cent.

Many rails of these kinds which are still in the track are indeed not yet become wholly unserviceable, but they already show such injuries, especially at the joints, through the flattening and springing or loosening of their separate welded parts that they cannot much longer remain in the track. The Phœnix cemented rails have lasted best.

The wear in the height of these Bessemer test rails, measured in the middle of the rails, has amounted up to this time to 1-12th to 1-5th of an inch; however, this can hardly be called wear, but rather a rolling away of the upper stratum of the Bessemer steel rails by the rolling stock running over it.

For instance, within the first few years there occurred a regular extension of the upper surface of the rails, so that a sort of nose was produced at their ends, such as is figured in Fig. 1, except that on this account the head was depressed

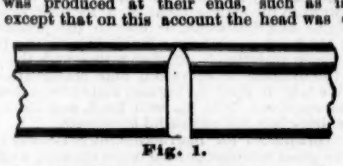

Fig. 1.

at these ends, as in Fig. 2. The author has made this obser-

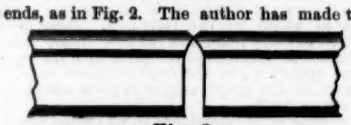

Fig. 2.

vation in later deliveries of rails (Pattern V.) in which he had the rails made with a decided slope of the head at the ends. (Fig. 3). This slope very soon disappeared and these rails be-

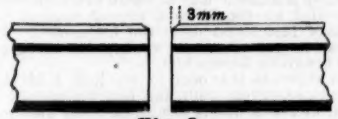

Fig. 3.

gan to form projections just like those in Fig. 1. In later years there began to be a similar rolling away at the side, so that just such a projection was formed on the outer edge of the rail-head. This became greater and greater, especially in the first track in the rails next to the switch rails (Fig. 4) so that it was

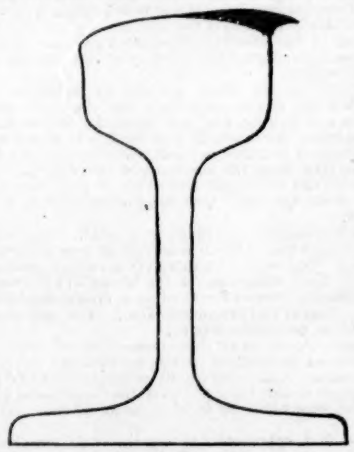

Fig. 4.

thought that the rail would go entirely to pieces, (Fig. 5).

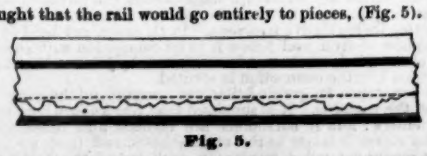

Fig. 5.

However, afterwards these flakes fell off, or were forced down by the rolling stock, and the rails appeared the same as before. The face of the rail-head was then perfectly clean and smooth, and up to this time not a single rail has developed any hollowing or broadening of the head. This process repeats itself continually. This shows, however, that the material used for the rails is *very tough*, for a brittle material would not endure this cold rolling, but would fall into pieces.

But that Bessemer steel is also a durable and strong material, the ends of the rails show plainly.

In consequence of the unusually heavy traffic on this line, and the imperfect, too weak fishing of the rails, the rail joints, in spite of being very often looked to, are seldom tight, the rails are constantly moving up and down, and are therefore exposed to very heavy blows from the wheels which run over them.

On this account, especially of late years, the Bessemer steel rails have been hammered down and broadened at the ends, as shown in the accompanying figures, Fig. 6 and Fig. 7.

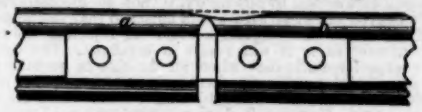

Fig. 6—Side View.

Fig. 7—Top View.

a. Rail *from* which the wheel runs.
b. Rail *towards* which the wheel runs.

But in spite of this not a single rail has broken or become otherwise spoiled; all the Bessemer rails are entire and can remain many more years in the track before they become unserviceable. But many of the other kinds of rail mentioned above have either broken or cracked at the joints.

In the behavior of these Bessemer steel trial rails, which belong to the childhood of the Bessemer process, and are properly still an imperfect product, during ten years' service we have sufficient justification for the statement expressed in the beginning of this report, that the future belongs to Bessemer rails, and that they, if progress continues to be made in their manufacture, will drive all other rails from the field.

After these Bessemer trial rails had lasted well for several years, and when meanwhile Pattern V. (with a sharp angle in the section and a good bed for the fish-bars) had been adopted with a considerably stronger rail joint, the management of the Cologne & Minden Railroad, in the year 1867, gave Krupp the first large order for Bessemer steel rails, and since that time the following amounts of Bessemer rails have been supplied to the Cologne & Minden Railroad:

1.	From Krupp	58,000 tons
2.	" Hoerde	20,625 "
3.	" Osnabrueck	13,750 "
4.	" Bochum	9,500 "
5.	" Rhenish Steel Works	8,000 "
6.	" Good Hope Works	7,500 "
	Total	117,375 tons

Besides many smaller supplies, mainly for making switches at the Cologne & Minden shops at Dortmund, amounting to some thousands of tons more—certainly a distinguished evidence of confidence in the excellence of Bessemer steel rails.

Of this quantity, which represents about 495,000 different rails 21 ft. 8 in. long, up to this time not one has been removed on account of wear; so far as the author has had opportunity to observe them in the track, they have so far lasted very well. A number of them have broken, it is true, both in unloading them and afterwards in the track; still the proportion, especially of the rails broken in the track, is, in proportion to the great quantity delivered, extremely small; for according to the official reports of the management in the years 1868 to 1873, of the above Bessemer rails on the average only 0.042 per cent. broke in the track.

The author does not hesitate a moment to assert that the cause of almost all these few breakages was not the *bad quality* of the Bessemer steel (lack of homogeneity and too great brittleness), but that, as is said above, the cause is chiefly to be sought in the improper and careless handling of the steel. It is a fact generally known that steel has but a short fiber (properly is of granular structure), and therefore is very liable to checks and cracks, especially when it is subjected to a quick change in temperature. Therefore the greatest care must be taken in the process of heating the rail ingots, and in this particular many works at first made very great mistakes. They heated the ingots in ordinary re-heating furnaces, exposed them from the first alike to a strong heat and so burned them, so that the steel, just as iron would have been, was necessarily made brittle. It is therefore to be insisted upon that the steel be heated in the largest possible furnaces, beginning with a moderate heat, and only gradually brought to the proper temperature, so that, if the expression may be permitted, it may suck the heat into itself completely. The temperature must be raised too high in the later stages of the heating, and therefore the ordinary re-heating furnaces, which are filled with coal and produce a strong flame on the front ingot, should be rejected, and gas furnaces used instead. In the latter furnaces the heat is more evenly distributed and is better governed. Most of the works which have already made experiments on this point have therefore adopted these furnaces.

Quite as injurious as working too hot, however, is a treatment in which the steel loses its heat, as, for example, when in consequence of lack of steam the rolls turn too slowly and the rails lose their clear red heat before they are completed. In this way, great and unequal strains are produced in the rails, which lessen their strength materially, and may result in fracture in case of an unusually severe shock. A similar effect is produced if Bessemer rails come hot from the rolls and then cool off too rapidly. On this account care must be taken to have the rails cool off gently, especially in winter.

For this reason, at some works where the cooling must take place in the open air, so that it may rain on the rails, the rails as they come from the rolls, after being straightened, are laid side by side and covered with coke ashes. It is better, however, if the cooling can take place under cover where the temperature is moderated.

As evidence of what has just been said the following, from various experiments made by the writer, may serve:

If a rail which has been broken because of too cold rolling is brought to a cherry-red heat and then cooled off slowly in water, or, still better, very gradually cooled, then it endures all possible tests, and cannot be broken.

The great hardness in the material used for Bessemer rails is also to be avoided, because a hard steel is much more brittle than and has not nearly so great resistance against heavy blows as a soft steel; and so hard rails break much easier than soft ones. Precisely on account of the danger of breaking, the writer has always insisted that all works should supply as mild a steel as possible. Probably there would not have been so many breakages of Bessemer rails on other roads, when first introduced, if certain railroad managements (bearing in mind perhaps the piles for rails) had not requested the hardest possible material.

With the slight and even wear of Bessemer rails, if they are

otherwise perfect, soft rails are much better than hard ones for the rolling stock also.

According to the writer's opinion, the tires of the wheels should always be somewhat harder than the rails, since they wear much quicker than the latter, and lose their roundness much sooner on hard than on soft rails.

According to the many years' experience of the writer, however, the chief cause of the frequent breakages of Bessemer rails is the *mechanical* injuries suffered by the rails after rolling, while cold, in fitting, in moving to and from at the works, and in loading and unloading.

While the author has found in numerous experiments that slight flaws and scales produced in roiling do not injure the rail, and that rails having such defects behave quite as well as perfect ones under the tests of the hydraulic press, the steam hammer and the drop, on the other hand every indentation in the rail-foot caused by any injury, if not so inconsiderable that it can be cut away with a cold chisel so that the place in question becomes entire again, is cause for rejecting the rail, since in most cases it will result in breakage. The writer knows experimentally that when an incision is made in the foot of a rail with a chisel or other sharp instrument, the rails so injured must break when subjected to blows which are not at all severe. However, it does not need an actual crack or incision to expose the rail to breakage; a sharp indentation of the rail-foot may induce breaking, although it cannot be maintained that in every case it will inevitably lead to that result.

Therefore, the greatest care must be taken in straightening the rails to avoid making any sharp indentation in the rail-foot with the press. In bending the pressure must be exerted upon the web of the rail and never on the rail-foot.

Bessemer rails must not be bent too much or too suddenly, otherwise there may easily occur, if not outward, visible injuries, yet interior strains which increase constantly under traffic and must finally result in the breaking of the rails.

In unloading Bessemer rails, also, it is impossible to exercise too great care, and it should be most strenuously prescribed to all who receive on the part of the railroad companies to proceed with the utmost circumspection in unloading Bessemer rails, in order to avoid any severe concussion; since the great shocks to which the rails are exposed when thrown upon each other may result in interior strains, and if the edges of the feet strike each other, sharp indentations may be made in them.

Quite opposed to this has been the policy of sundry railroad managers who have directed that the rails should be thrown heavily from the cars in order to test the rails in this way, and to cause the breakage of such as had invisible defects, either without or within, before using them. They did not think that, although in this way the imperfect rails might be discovered, on the other hand many rails might be damaged, so that after all they could not be sure that all the rails laid were perfect and uninjured.

Many experiments which the writer has conducted at various works with Bessemer rails which had been broken in unloading or in the track afterwards, establish perfectly what is said above, since pieces of those rails not having the above-mentioned defect endured the severest tests, and under the press as well as under the drop and the steam hammer suffered a deflection of 150 millimetres in a length of 1 metre (6 in. in 39⅜ in.) without showing the slightest flaw or crack.

As evidence of the tenacity of Bessemer steel the behavior of the rail-feet may serve. These were so extended at the point of deflection that they had become as much as 9 millimetres (0.36 in.) narrower.

In order to avoid doing injury to the strength and durability of Bessemer rails, and to secure them against breaking as far as possible, the greatest care must be taken to avoid any mechanical damage, especially to the rail-foot, and from this follows the danger of *notching* Bessemer rails.

If, as has been said above, a sharp indentation may lead to the breaking of a Bessemer rail, how much more may a sharp notch.

Aside from the fact that the rail is considerably weakened at the notched place, the injurious effect caused by the punching out or cutting out of the notch, as accurate investigations or experiments have established, is much greater even than in the case of sharp indentations. As in the latter case, so in an increased degree in the case of notching, on account of the destruction of the continuity of the separate molecules, a number of very fine, hair-like cracks are formed about the sharp angles of the notch. (Fig. 8).

Fig. 8.

These afterwards grow larger, and, especially in rails rolled cold, in which great strains exist, may become dangerous and lead to fracture. Experience has shown that on roads which use notched Bessemer rails many of them have broken, and always at one of the sharp angles of the notch. The many experiments which the writer has directed at the rolling mills have given the same result.

Notched Bessemer rails afford only a moderate resistance to heavy shocks and blows, and break under a relatively small load. As confirmation of this fact we cite the experience of a road-master at Gelsenkirchen, who had notched a number of Bessemer rails while they were in the track. Seven of these rails broke immediately after the first trains had passed over them.

That the notches and not the material is at fault in such breakages the author has found by many experiments. If we remove such sharp incisions and indentations by cutting them away with the chisel and file, or if we plane them off, so as to be sure that the rail-foot is entirely safe, then such a Bessemer rail may be subjected to the severest tests without breaking.

Bessemer rails suffer an injury similar to that caused by notching when the holes for the fish bolts are punched in them. (Fig. 9.)

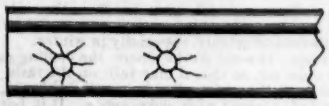

Fig 9.

In that case, hair-like cracks are produced about the holes just like those about the sharp angles of the notches. Here, too, the continuity of the separate molecules is destroyed and a weakening of the rail at the place in question is caused, which may finally lead to its breaking.

At first, many rails were broken through the bolt holes, and regularly in the manner shown in Fig. 10;

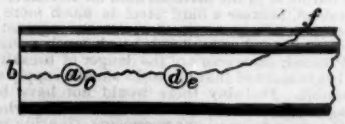

Fig. 10.

first, horizontally from *a* to *b*, then, after the continuity in the web has once been destroyed, horizontally from *c* to *d*, and afterwards obliquely up into the head of the rail and to *f*.

Since drilling the bolt-holes has been introduced such breakages have occurred very rarely.

Whether it is possible to lessen the danger from notching by abolishing the practice of punching out the notches or cutting them out with the chisel, and making them, for example, by saws while hot, is still an open question. The author has recently made various experiments with rails so notched, but hitherto, probably because the tools with which the notches were made were too imperfect, these have not given an entirely satisfactory result.

It is to be hoped that an unobjectionable method of notching may yet be introduced.

A remedy has already been found by the help of what are called "joint angles" screwed to the fish-bars on unnotched rails, or by aid of a foot rolled in the fish-bar, which afford provision against the creeping of the rails.

From what has been developed above, we may draw the following conclusions:

Bessemer steel rails are undoubtedly the best rails that can now be produced.

Care must be taken to avoid causing any mechanical injury to Bessemer rails in fitting, in transporting, in unloading and in handling them.

If, notwithstanding, Bessemer rails with mechanical defects are laid in the track, ordinarily they break the first time they are severely tried.

It is therefore advisable to have the Bessemer rails carefully watched during the first six months after they are laid.

The above-mentioned faults of Bessemer steel rails will in no long time disappear or be reduced to a minimum, as on account of the high degree of responsibility and his guarantee for many years, the manufacturer will do as much as possible to supply a perfect material, and we can only repeat that great progress has already been made in the process of manufacture.

Not alone by the manufacturer, however, is progress to be made, but the consumer also should learn to be familiar with the properties of Bessemer steel and to treat it accordingly.

Practical Education.

So much has been said about technical education lately that the publication of the following article, which is re rinted from "*Colburn's Railroad Advocate*" of July 21, 1855, and was, in all probability, written by Zerah Colburn himself, may, perhaps, serve to direct attention to the education of that large class who cannot avail themselves of the advantages offered by the "technical schools:"

A young mechanic, in the repair shop of one of the great roads, writes us to know how he can "best inform himself on the principles and construction of the locomotive in the least possible time." This is Young America to the bone: There is ambition, purpose and dispatch in that inquiry. Well, we are glad to answer him.

We do not take it for granted that our friend intends to become a lecturer on locomotives or a patentee of locomotive contrivances. However, we do not know in what direction the bent of his genius may lead him. Still, we shall suppose him looking forward to the management of a locomotive shop, the post of designer and draftsman, or else to the practical management of the locomotive itself. We incline to the first supposition, because ambition is satisfied rather with the creating than with the routine of operation and preservation of its subjects. We take it that the highest ambition of our young friend is to construct, from his own head, and the necessary materials, a first-class and successful locomotive.

As for opportunities for instruction, he is already in a university. The great machines which come smoking and hissing each day to the station of which the shop is part are the best illustrations to which we can refer him. These great monsters, dissected to every joint, and turned inside out to his examination, are as much more complete than the most costly philosophical apparatus, or the most elaborate engravings in English books, as the great engine is more complete than a patent-office "model."

The best treatise for his assistance is, we should say, a pocket book, containing from one to twelve sheets of *blank paper*. If he is unable to understand such a manual, a good drawing pencil will assist him much, provided he makes good use of it. And the best key to this treatise is a two-foot rule. A good standard school arithmetic may be useful as a book of reference.

Thus provided, we should consider our student "entered" for a course of instruction upon the locomotive. We are in sober earnest in our advice, as we hope to make our friend understand before we dismiss him.

We do not expect he is at once to see how a blank-book, a pencil and a two-foot rule will make him understand the locomotive. All we ask of him is to read carefully what we say.

Some men, who learn fast, say the way to master a subject is to write a book about it. Why? Because the whole mind is thereby engaged in the subject. It compels observation, reflection and decision. All that you can learn will depend on the condition of your own mind.

If, then, you measure the cylinder of a locomotive, its diameter, and get the length of stroke and diameter of driving wheel, you have three leading dimensions, which, taken together, give a tolerable idea of the size of the engine. By recording these memoranda in the aforesaid blank book you have established or laid down a standard, with which you can afterwards compare other engines.

Next, when occasion offers, get the circumference of the boiler with a tape measure, calculate the diameter, and allow for the iron and lagging, and you have the inside diameter. Get the length of the tubes, by pushing a pole or rod through. Don't be afraid of your new overalls, but dive into the fire-box with a lamp, and count the number and measure the diameter of the tubes. Get the length and width of grate and measure the depth of the fire-box. Note down every item in that same blank book.

This fire-box experience will do you good. You will have a chance to see what is the appearance of iron after different kinds of use. You may get an idea of the art of tube-setting, and possibly learn something of the beauties of the usual system of caulking. You will notice how a crown sheet looks, in case it has been at any time overheated. You will observe in what condition the grates may be.

The leading object, in all these measurements, is to impress upon your mind the relation in size between the several parts of the machine. And no tables in printed works and no verbal description would make one-half the impression on your memory and your habits of thinking as would this kind of experience.

Take the first opportunity to slip in at the man-hole of a boiler, in the shop for repairs. Notice sharply how the boiler is stayed; where the seams are made about the furnace; how the steam pipe and throttle are placed; measure the domes and notice their relative positions. In all cases, get hold of a single piece of iron and follow it to its connection with something else. Find out how it is connected, by joint or bearing, and notice *how* the connection is secured.

It is here taken for granted that you comprehend the general plan of the machine. It is supposed that you know where the water enters: how it surrounds the furnace and tubes, and how the steam is taken to the steam-chests, and then admitted by something called a valve to each end of the cylinder. The existence of a piston in the cylinder, its connection through the parts visible from the outside with the driving axle, it is taken for granted that you understand.

Now, then, go on in this manner, measure and put on record the several parts which come in your way; observe the general relation between the sizes of different parts of the same machine; note especially the different arrangements of the parts, and make all your observations matters of record in the ever-ready blank book.

In all this time, it is supposed that you are making yourself familiar with the names of the detailed parts, and that you are at work discovering *reasons* for as much as possible of what you see. You will have to do as much original thinking, and cross-question your companions as much as you had ever before done on any other subject—probably much more.

Before you adopt all this advice, you will naturally ask if it will not make you a copyist, and fill your head only with odds and ends of other people's engines. Not if you properly digest the facts which you collect. You will have obtained an idea of the relations of the several parts of the machine to each other—in their size, position and connection. You will have learned to recognize the leading object and function of each part.

We think the knowledge of constructive details should precede the study of general principles. Our friend should then be his own judge of the proper term of his attention to the matters already pointed out, for it would extend to the period at which he might feel able to undertake a more rigid and exact method of self-instruction.

The course we have proposed would prepare him for the study of abstract principles. He would acquire a habit of close observation—of diligent attention to details; he would appreciate the distinctness laid down in the books; he would retain whatever he might read, because he would have something in his own mind to compare it with, something to add to it, something to give it a new or a wider application. In instruction, each step should prepare the mind for what follows, and it is more to the state of the mind than to the matter of formal teaching that he must look for positive and permanent results.

We have done the best we can for our friend. If he is disposed to take our advice in the sincerity in which it is given we think he will soon understand what it is to have the mind prepared for the reception of facts and the comprehension of principles. He will find that the hardest apparent problems about the locomotive become the easiest when the mind has had a little previous training to approach them.

Contributions.

"German Theorists and American Bridge Engineering"—A Letter from Professor Winkler.

Louisville & Nashville and South & North Alabama Railroads,
LOUISVILLE, Ky., Aug. 5, 1876.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Upon your request I forward you the inclosed letter from Professor E. Winkler, of the Polytechnical High School at Vienna, Austria, in answer to a publication which appeared in your journal May 12, 1876, entitled "German Theorists and American Bridge Engineering," by Mr. Ch. Bender, C. E.

In justice to Professor Winkler, with whom I am in constant correspondence, I must say that all his letters express acknowledgment and admiration of our modern American bridge construction in the very highest terms, while he is also posted in regard to American practice as well as this can be done from publications, specifications, drawings, etc., which myself and others have been and are sending him.

FRED. DE FUNIAK,
Chief Engineer and Superintendent of Machinery.

VIENNA, Austria, June 12, 1876.

CHAS. BENDER, C. E.:

SIR: You have been kind enough to send me a copy of the *Railroad Gazette* in which you have published an article aimed against German theorists, and especially against me. In answer thereto allow me to make the following remarks:

You say that I speak contemptuously of American practice without knowing it. Now, I must contend that I know as much of American bridge-building as possibly can be known here. I have studied all that has been published on the subject, within my reach, and some American engineers, with whom I have been and am in friendly correspondence, have sent me numerous communications, drawings and photographs. In my letters to those gentlemen I have always given expression to my admiration of what has been done in that line in America. I have not published a word tending to belittle American practice. The collection of bridge models belonging to my department of the Engineering School was the first one here in which American bridge-building was represented.

But the remarks I made on your article in the *Journal of the German Engineers* had reference to the presumption with which you speak so contemptuously of the performances of European engineers. I think so highly of a great deal which has been done in America in this direction, that, without hesitation, I recommend it for imitation; I also perfectly agree with you in much of what you say in your article in the *Journal of the German Engineers;* but by no means do I give myself entirely over to American practice. My special views on the subject I intend to express in an article soon to be published.

Your views on theory with us fortunately belong to the past. Here, too, there are individuals who hold such views, but the majority knows better. The opinions expressed by men of practice on the organization of the technical school, about to be built at Berlin, make it appear that the practical men, also, know better. My friend, Professor Sternberg, of whom you speak so highly, is, too, of this turn of mind—is what you are pleased to call "a man of this kind." With the views you have expressed, you will hardly here be considered competent on that point. I do not mean to say that you know nothing of theory, for your works on continuous girders, and a pamphlet on timber constructions, written, if I am not mistaken, by you, prove that you are theoretically educated. But judging from what you say about the value of theory, and especially from the low estimation in which you hold German theorists, one who did not know your theoretical works would certainly take you to be ignorant on the subject of theory. People may hold different opinions on the value of theory; but to call bad names, without strict and convincing proofs, is of no use and hurts only the person who does it.

The assertion that complete experiments on riveted connections never have been made on the continent, and that whole

girders never have been tested, is wholly incorrect; although it must be granted that much remains yet to be done in this direction. How great a value I myself attach to this may be seen from the recommendations which I caused to be made to the government of Austria, to establish an institution for testing building materials and constructions. Notwithstanding the warm support the undertaking met with from prominent persons and members of the House, yet the necessary means, so far, have not been furnished, which is caused by circumstances beyond our control. I have heard with great pleasure of the appropriation of a considerable sum by the Congress of the United States for experiments of this kind. But this, too, will be of little use, unless the results are treated theoretically.

You say that German students are taught a "heaven-and-earth embracing" science, while in the United States only one specialty is thoroughly studied. This remark shows lack of information about actual circumstances here. In the German technical high schools (and the same holds true of the French and Italian ones) the sub-divisions are certainly carried as far as it practically can be done. As a student cannot know into which branch of practice his fortune will lead him, a system of sub-dividing would be to the greatest disadvantage to the student. A conscientious professor never goes too far into the depths of his science, and especially into the application of theory, knowing as he does that by far the greater part of the students are only moderately gifted. Do not think that the complete theoretical works published by me are taught the students: I only teach what is indispensably necessary. Those who are not naturally gifted in the way of theory will too be found useful in practice; they are not at all overlooked here, and it does not injure the practice even if the greater part of engineers belong to this class. But it is unreasonable to assert on this account that those who devote their lives to the development of theory and its application to engineering science have no good right to exist. If I have earned some reputation here in Europe (and even in America) it is principally on account of my working for a close connection between practice and theory.

Your special remarks about me show that you are entirely in the dark as to my doings and the object of my books. My course has been from the beginning a practical one; and I was called to the Polytechnicum at Vienna to teach railroad building, and the practical part of bridge-building (not the theoretical part, which is confided to other persons). If I am not practicing at present, the reason is that practice cannot well be united with the teaching, and also because of the rules of the University; nevertheless I avail myself of every opportunity of coming into contact with practice. I frequently visit industrial establishments in Europe, keep up connections with many practical engineers, and there is hardly a large and important bridge that I have not personally examined; besides, I am often consulted by the government as well as by private parties. Many bridges are built under my influence, or at least according to principles advocated by me. As a member of the Imperial Commission on Privileges I have also frequent opportunity of coming into contact with practice.

When you say that my books *nauseate an experienced reader by their total want of practical knowledge*, it can hardly be applied to books the tendency of which is a purely theoretical one. If the remark is meant to apply to those of my books which have a practical aim, I shall be perfectly satisfied with the favorable criticism my books have met with in Europe, far beyond my expectations. In France they have found approbation, as for instance you may see from the fact that, at present, a French translation is being printed, which, so far as the practical part is concerned, is edited by the head of the bridge department of an important French work, and as to the theoretical part by the engineer of another French work. But such books are not intended for men of your kind.

The assertion that I more than other professors "build my castles on sand" shows that you neither know mine nor other people's works, else you would have perceived that my works are based upon the same principles as those of others, in America as well as elsewhere. The difference is only the purely mathematical way of treating the subject.

You say further, "those professors instead of making the problems simple, have only a talent for making them complicated." How well you are informed! The object of all the theorists with us is to simplify the problems so as to come as near as possible to the truth. The deficiencies to be found in the theories yet, with reference to principles taken from physical science, we are acquainted with, at least as well as you. There is no occasion for professors of a technical high school to attempt making them intelligible to *mechanics*, as you would have it. In our primary technical schools this is done, however, as far as seems expedient for the education of foremen of shops. Let me give you an example: A rational theory of arch bridges was for the first time applied at the building of the Rhine bridge at Coblenz by Professor Sternberg, so highly esteemed by you. A mere glance at the long formulas which Sternberg used and published in *Erbman's Journal for Builders* must have nauseated a man of your kind. Nevertheless these theories were, if I am not mistaken, employed, with but slight modifications, for the calculations for the arch bridge at St. Louis. The *material simplification* which I have worked for in calculations of arch bridges, by application of graphical statics, which already is being introduced with us, and certainly bears testimony of striving after simplification, was not known in your country.

You would have us to follow blindly American rules of construction, and assert that Sternberg has done that with reference to the systems of Town, Long, Howe, Pratt, Whipple, etc., considered more or less antiquated even in your country. In that way all professional independence would disappear. My principle is: "Prove all and retain the best."

It would seem more becoming to you in future to be silent, and not criticise in quite an inappropriate way the developments of whole nations. You are not the man to step in and regulate the history of technical science.

Yours, truly, E. Winkler.

Running the Fast Train over the Central Pacific.

Wadsworth, July 30, 1876.

To the Editor of the Railroad Gazette:

In your issue of July 7 is an article from Sacramento, signed "W. H. S." In it he goes on to say that Mr. H. S. Small had run Engine 149 all the way from Ogden to San Francisco; in his own words—"who, with but one short rest for food, remained at the throttle during the trip." The writer heard some one tell the story, for an eye-witness he could not have been, else he would have seen that Mr. Henry S. Small took a rest from Winnemucca to Truckee, a distance of 206 miles, which was run by the regular engineer, Mr. James Wright, who, allow me further to state, had charge of his engine, and never left her from Ogden to Oakland wharf; and the reason Mr. Henry S. Small ran the engine at all was that he had been over those other divisions running a pay-car engine. If there is one thing on the face of the earth wholly mean, it is a falsehood, and more especially when told as a kind of history to make certain men famous that are not in the least deserving of it; and any one seeing this article will know that I am telling the truth. Any one at all acquainted with locomotive running knows it is not so much of a trick to run a locomotive, but a good deal more so to keep her up, to all of which Mr. Small is not entitled to in the least, not so much as to take an oil can in his hand to oil the entire trip; and I don't think that he claims it himself. * * * Honor to whom honor is due. Justice.

[The letter published July 7 may have given too much credit to Mr. Small, but there was no indication that he had anything to do with it, and certainly he should not be blamed for any inaccuracies that it may have contained. Certainly pains should be taken when credit is given to one person not to withhold that due to another, which seems to be what "Justice" has most to complain of. If the engine was Wright's and regularly run by him down to the time of this trip, and was cared for by him on this trip even, that is a fact which should appear in the record, of course, as well as the fact that Mr. Wright ran his engine over his own division. Certainly the credit for the good condition of an engine during a trip is largely due to the man who ran it immediately before as well as during that trip. "Justice" in his vehemence to claim the honor due to Wright seems unwilling to grant any to Small, who certainly should get credit for his own part of the work, though of course not for his own and Wright's too.—Editor Railroad Gazette.]

Inventors and Managers.

Yates City, Ill., July 29, 1876.

To the Editor of the Railroad Gazette:

In your paper of May 19, containing my letter of May 6, on the subject of testing inventions. I noticed a letter from "H. C." on the same subject, and I judge from the tone of his letter that he is a railroad manager, or at least a manager's clerk, and that he is anxious to impress upon the minds of inventors that managers are perfectly overrun with new devices—good, bad, and indifferent; and also that said managers have not time to even look at the many improvements offered. Now, my experience has taught me that managers are inclined to be accommodating to inventors while they are making preliminary experiments and until their inventions are completed and secured by patent. Then, unless the manager is interested in the patent, his interests and the interests of the company that he represents, are directly opposed to those of the inventor, and it is his duty to make it appear that the invention is worthless, or at least no better than other devices used for the same purpose; and of course he is not going to allow the inventor any facilities for testing his invention. In order to show how this thing is managed by railroad men, I will again refer to my letter of May 6, in which I related that a road master having charge of 500 miles of track offered to bet $10 that a certain rail-joint fastening, a model of which I showed him, could not be kept in the track for twenty-four hours. And this proposition was made to me after I had had one in the track for three months without said road master's knowledge or consent. The upshot of the matter was that the said rail-joint fastening was removed soon afterwards—probably by order of the road master, who, I have since been informed, is interested in another kind of joint fastening. W. H. Robinson.

[What our correspondent says is unfortunately true. *Some* railroad officers in all probability do receive bribes in the form of commissions, shares in joint stock companies, patent fees, etc., and thus have their "judgments perverted." What is worse, there are many persons at the present time who do not regard such practices as wrong or dishonest. But our correspondent's logic is too sweeping; because some men are prejudiced in this way, it does not follow that the reason why his patent rail-joint does not come into use is because *all railroad men receive bribes*. He also makes a mistake in not allowing enough for the element of human error. The railroad men may be quite honest about their estimate of the value of his rail joint, but yet their judgment be wrong, and—though this is probably inconceivable to our correspondent—*he* himself *may be mistaken* in his own estimate of its value.—Editor Railroad Gazette.]

Duplication Under Difficulties.

To the Editor of the Railroad Gazette:

A certain executive was inclined to find fault with his clerk for not sending a message up to his house at 8 p. m., in which the aforesaid clerk saw nothing immediately important. Would it not be well for managers and general superintendents to acquaint their clerks with their proposed movements, so far as leaving town and similar superficial matters were concerned? I think, as the *Gazette* fully explained last week, managers ought to receive more help from their clerks, but a mutual confidence must exist; they cannot work in the dark.

Duplicate.

THE SCRAP HEAP.

Railroad Manufactures.

The car works of John L. Gill, at Columbus, O., are running upon orders for the Cincinnati Southern and other roads, and have more work on hand than for a long time past.

The Edgemoor Iron Company, near Wilmington, Del., have just shipped another span 255 ft. long for the Susquehanna bridge at Havre de Grace, Md., on the Philadelphia, Wilmington & Baltimore Railroad. They are now shipping the work for the Kentucky River bridge on the Cincinnati Southern Railroad. This bridge was designed by the Baltimore Bridge Company and will be the highest in the world, being 275 ft. above the river. It is a deck construction, 1,125 ft. long, 39 ft. deep, composed of three continuous spans 375 ft. long each, supported upon two wrought-iron piers 176 ft. high, resting upon stone foundations 66 ft. high; the extreme ends of the bridge rest upon stone abutments. The Baltimore Bridge Company, who put this work up, have, owing to its great height, designed it to be erected without false works, and it has been so constructed. The Havre de Grace bridge is erected by the railroad company.

The Edgemoor Iron Works are also the contractors for and are now erecting the Gilbert Elevated road in New York, that portion in Amity street being completed.

The Emaus Iron Company's furnace, at Emaus, Pa., was recently sold at public sale to C. H. Nimsen, Superintendent of the Allentown Rolling Mill, for $270 and the mortgages upon the property.

The Westinghouse Air Brake Works, at Pittsburgh, were closed last week for the purpose of taking stock. In order that the men might take advantage of their vacation, the company presented each of its employes with a ticket to Philadelphia and return.

A Defrauded Baggageman.

The Burlington *Hawkeye* says: "We went down to the Union depot yesterday and found Walter Seeley in a flood of tears. He sat down on one of Mr. Holtermann's tin trunks, and as his No. 11's clove the air in their returning arcs, the end of his nose grew rosy under the repeated application of a centennial handkerchief. There wasn't anything especially the matter with Walter. He only needed a little encouragement. In the first place a man had palmed off a boxwood trunk on Walter as one of those trunks built of pine siding, and when Walter had gently jammed it up against the wall in an off-hand kind of way, and it didn't phase it any, and then when he had thrown a couple of iron-bound sample cases at it, and run a truck full of baggage over it, and dropped one of those great big emigrant boxes on it, and still that trunk with its deceitful cheap russet cover came up smiling and entire, he began to get discouraged, and he pulled the trunk out on the platform and let the United States Express wagon run over it, and it never indented it; and then he sadly loaded it back on to the truck and rolled it back into the baggage room and sat down to weep. And we left him alone with his grief."

Westinghouse Brake in Belgium.

A French engineering journal, *La Revue Industrielle*, says that the results have been so satisfactory with the experimental train furnished with the Westinghouse brake which has been running for three years on the State railroads of Belgium, that orders have been given to extend its application with a view to its general use on these lines.

Amateur Railroading.

The Grand Rapids (Mich.) *Eagle* of recent date tells how some farmers in the neighborhood of Berlin, Mich., lately borrowed a pile-driver of the Detroit & Milwaukee road. Having done their work and being properly desirous of returning the pile-driver promptly, they procured a flat car, which they hauled out upon the main track a little way from the station and quietly proceeded to load up. As they did not know or did not think of the necessity of putting out signals, they had just about got their car loaded when a freight train happened along, and not seeing the car, as it was dark at the time, struck it, wrecking it and damaging the engine and several cars of the train.

PERSONAL.

—Mr. J. C. Andrews, General Southern Agent, and Major Edgar Vliet, General Southwestern Agent of the Selma, Rome & Dalton road, have resigned their respective positions.

—Mr. W. S. Alexander has resigned his position as General Freight Agent of the Lake Superior & Mississippi road.

—Mr. W. M. Cowgill has resigned his position as General Freight and Ticket Agent of the Jacksonville, Pensacola & Mobile.

—Mr. J. P. Hains, for several years Auditor of the St. Louis & Southeastern, has resigned his position.

—Mr. W. H. Bryant has resigned his position as General Agent of the Vermont Division, Portland & Ogdensburg road, which he has held for 3¼ years past.

—Mr. S. H. Dunan, formerly Auditor of the Erie Railway and previously of the Baltimore & Ohio, has retired from the firm of Eugene N. Robinson & Co., brokers, and is established in business by himself at No. 30 Broad street, New York.

—Mr. Abial Stevens, a patriarch among railroad contractors, died recently at his residence in Amherst, Mass., at the age of 72 years. He had had contracts on the Boston & Providence, Western Troy & Greenfield, New Jersey Central and many other roads. He retired from business several years ago.

—Mr. Oliver Hoblitzell has resigned his position as General Agent for the Baltimore & Ohio at Camden Station, Baltimore. Mr. Hoblitzell has been connected with the company for 15 years past. It is understood that he will retire from active business for a short time, taking a much needed rest.

—Hon. Joshua Alsop, of Carlisle, Ind., for many years a director of the Evansville & Crawfordsville Company, died July 30. He was the oldest member of the board.

—Mr. Alfred Lockhart, of Angelica, N. Y., President of the Rochester, Nunda & Pennsylvania Company, and also of the National Bank of Angelica, has failed disastrously in business. His embarrassments are said to arise chiefly from his connection with the railroad company.

—Mr. J. M. L. Staughton has resigned his position as Superintendent of the Eastern Kentucky Railroad.

—Owing to continued ill health, Mr. George McLeod, Receiver of the Louisville, Cincinnati & Lexington Railroad, tendered his resignation Aug. 3, and it was accepted by the Court. Mr. McLeod is well known as having been Chief Engineer and constructor of several important lines. His administration of the Louisville, Cincinnati & Lexington has been very successful, as shown by the great growth in the net earnings of the road under his charge.

—Col. S. L. Fremont has resigned his position as Chief Engineer and Superintendent of the Carolina Central Railroad.

RAILROAD GAZETTE

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CONTENTS:

Editorial Announcements.

Passes.—*All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.*

Addresses.—*Business letters should be addressed and drafts made payable to* THE RAILROAD GAZETTE. *Communications for the attention of the Editors should be addressed* EDITOR RAILROAD GAZETTE.

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

EDUCATION OF PRACTICAL MEN.

So much has been said and written recently about technical education and technical schools, that perhaps it may not be amiss to give some consideration to the interests of that large class of students of engineering to whom the advantages of the technical schools are quite out of reach. The old system of apprenticeship which existed fifty years ago has now almost passed away. Apprentices then were under the immediate care of their master. They lived with him, were instructed by him, and their whole conduct was to a greater or less degree subjected to his control. This relation no longer exists, at least in engineering establishments, and in its place we have, it is true, indentured apprentices, but the only control they are subjected to is that of the foreman in the shop and the rules for the workmen. The instruction they receive is often very limited, and their opportunities of learning are only such as they choose to make use of themselves. The question then which presents itself to many young men is how to acquire the practical and theoretical knowledge necessary to enable them to rise in their occupation with the time and opportunities which are offered. Their duties to their employer require them to give ten hours per day to their work in the shop. The amount of study which any ordinary person can do after this amount of labor is very little, and therefore it is the more important that it should be well directed and that the very little time at their disposal should not be wasted. There can be no doubt that a school, with all the appliances needed for instruction and with well trained instructors, offers immense advantages for the acquirement of theoretical knowledge over those which an indentured apprentice can avail himself of; but it should be remembered that in the acquisition of practical knowledge the apprentice has much the advantage over the student. In the one case the student is taught what and how to think; in the other the apprentice learns how to do. Therefore, while an ambitious young man may lament that the advantages of the technical school are not his, he has for a compensation the advantages of practical experience and familiarity with the objects themselves. It is of course true that no person can, in a broad sense, know what to do, without, at the same time, or perhaps before, knowing what to think. The most difficult part of the education of a young apprentice is, therefore, the training of his thinking faculties. Now, how shall this be done? Take the case—which is a very common one all over the land—of a young man, the son of parents who are poor and industrious but quite uneducated. In his early life he has never been familiar with the companionship of books, or of persons who are acquainted with books. He knows very little of their use, excepting that which he acquired in a public school, when, during brief intervals in winter, he may have acquired some knowledge of reading, writing and arithmetic. During that time these have been placed in such an attitude that they appeared like enemies instead of friends. Such a young man is placed in a machine shop, or goes as rodman on a surveying party or brakeman on a railroad, where he soon discovers, or should, that his progress is obstructed by his want of education.

Or put it in a different way: He starts out in the world and is told that by "getting an education" his chances of success will be greatly increased. The question which then presents itself to him is, how is this to be done? To him education is a very vague and indefinite term. He does not know exactly what he should learn first, and quite as likely as not, he will begin with a study or a book which it is quite impossible for him to master without a considerable amount of preliminary knowledge. Such persons are very liable to waste a great part of the little time they have at their disposal by misdirected study and to make their exertions very ineffective for the want of knowledge of the best course to pursue. The writer once knew of an ambitious young man who copied a good part of Herodotus in order to familiarize himself with it. This involved an amount of labor which would have been tenfold more productive if directed in some more profitable way.

To any young man who is obliged to educate himself, it may be safely stated that no other study or labor will be nearly so profitable as that which is necessary to acquire a thorough knowledge of the three elementary branches named above, if he has not already mastered them. If he do not know how to read and spell with perfect facility, no labor should be spared, day or night, until he has acquired that knowledge. Next he should learn how to write legibly and correctly. Without being able to do this, it will be impossible for him to fill any ordinary positions of trust or transact any business which is at all remunerative. In fact, it may be set down as being absolutely impossible for an engineer or mechanic to rise in his occupation without knowing how to read and write with at least tolerable correctness. If, therefore, we are addressing any who have been so unfortunate as not to have acquired that knowledge in youth, let them not be content until they have learned *to read with facility, to spell correctly and to write legibly.* We italicize this, so as to make it appear as definite as possible. In doing this, get a teacher to assist you, and have regular times for recitations and don't allow any except absolutely necessary causes to prevent you from receiving your lesson. By having a teacher and times for recitation, it will prevent you to some extent at least from neglecting the study without which it will be impossible to succeed. This neglect and weariness will be the greatest difficulty in the way of learning. The study and the task will soon grow monotonous, and pleasure appear much more attractive. The student who is obliged to educate himself *must* have persistence, and he should lay to heart the fact that if he undertakes to accomplish any good purpose, and fails on account of his own fault, his capacity for overcoming difficulties is weakened thereby; but if he perseveres and *succeeds*, his character is strengthened by the effort he has made and the result achieved. To begin a task of this kind, therefore, and to give up, fail and break down in a miserably indolent and cowardly way, is an indication that a person has not the stuff in him which deserves success.

We have set the task for the first step; the next will be to learn arithmetic and natural philosophy. These two studies are regarded as of next importance to a young mechanic or engineer. Grammar and geography may be put off until a later period. If he acquires the knowledge we have indicated *thoroughly*, he will then be able to make use of the information which he will find scattered all about him, in the shop or on the road or suggested by his daily duties; but without knowing how to read, write, make calculations, and with no acquaintance with natural laws, he will be like a man who is blind. He cannot see or comprehend what is about him.

The importance of acquiring this elementary information cannot be impressed too strongly. As some one has said, it is the first step which costs and is the most difficult.

In an article, evidently by Zerah Colburn, on "Practical Education," which appeared in the old *Railroad Advocate* more than twenty years ago, and which is reprinted on another page, he advises that a pocket-book of blank-paper is the best treatise for the assistance of a young student or apprentice is within certain limits very true, and those disposed to lament because they cannot have the advantages of a technical school may lay to heart what he says of a machine shop, that its apparatus for instruction is better than that in any university.

We will suppose then that our apprentice has achieved the work laid down for him, and that he has equipped himself with a blank-book, two-foot rule and a pencil. For directions in using the blank-book we will refer him to the article on "Practical Education," supplementing it with the recommendation that he should pay constant attention to the cost of all kinds of work. Perhaps one of the most prolific causes of the want of success of engineers and mechanics is their neglect of the commercial side of their occupation. An eminent engineer, during the discussion of the relative merits of American and European bridges, said that English engineers usually did not trouble themselves much about the cost of the work they did, as they regarded it as the duty of those who employed them to furnish the money and of the engineers to spend it. This feeling, although, perhaps not often expressed so plainly, is much too common among engineers, and probably those whose money they spend often suffer quite as much from their *ignorance* of the business aspects of the work they are employed on as from their indifference to its cost. Our advice to our young man therefore is, to enter in his blank book not only the dimensions, proportions, etc., of the work about him, but to get the weights, quantities and cost. He will find that by constantly keeping up the habit of collecting such data he will acquire a store of information which will be constantly increasing in value, and whose usefulness will be realized only in after years. He will in all probability be constantly called upon to refer to the weights of car-wheels, axles, engine wheels, cylinders, boilers, etc., etc. Get such information as the weight of axles before and after being turned, the cost in the rough condition, and the loss in finishing, the value of the material turned off, the time required to turn them. Apply similar methods to all kinds of work which comes under observation. The most out-of-the-way facts are often the most useful. Weights of different parts of machinery supply useful data in estimating cost.

The next step of the young student will be to learn something of drawing. As quoted by Colburn, some one has said "if you want to understand a subject, write a book about it." A similar recommendation might be made about a machine or other engineering work, if you want to understand its construction, make a drawing of it. There is no branch of knowledge which is of more service to an engineer than drawing. With the sketches and dimensions which the student will collect in his blank book, he will be able with a little instruction in mechanical drawing to represent the objects in the construction of which he is employed. In doing this, he should constantly ask himself the reasons why certain things are done as they are. This at once opens an immense field of inquiry, and he will soon find that the subjects about which he is ignorant will require investigation in many different directions. He must learn something about the strength and nature of the materials he uses, the laws of their resistance, their chemical composition and methods of manufacture. If he studies combustion or boiler incrustation, he will be obliged to get some knowledge of chemistry; if he looks into the economy in the use of steam, he must study the laws of thermodynamics. If he attempts to calculate the dimensions of a boiler or other object, he must learn something about mensuration and geometry. If he attempts to calculate the strains on the different members of a bridge, and gets any of the books on the subject, he will find that the methods employed require a knowledge of algebra and calculus, and, therefore, in order to become master of this subject he must extend his knowledge of mathematics. In this way his inquiries will gradually lead him from one subject to another, and his way will be indicated by the work he does.

Some warning should be given about the purchase and reading of books. It is hardly ever safe or wise to buy a book without knowing something about it. At present there are large numbers of so-called scientific books published which are almost worthless. They are printed by publishers who are either ignorant or indifferent about their value, and are published to sell. There is so much good literature relating to scientific and engineering subjects now that it is quite unnecessary to waste time over poor books.

We will finish with Sidney Smith's advice: "Take short views of life." Don't undertake to do too much, or anything too hastily; but having after due consideration commenced to study any subject, hang on with invincible courage and persistence until it has been mastered. Sometimes a comparatively useless undertaking may be worth completing in order to avoid the demoralizing effect which a surrender entails. But don't lay out more work than can be done. There are only twenty-four hours in a day, ten of which belong to your employers, so that the time you can devote to self-education is limited, and if you are

wise you will aim to make the best out of the little time at your disposal.

THE MICHIGAN CENTRAL REPORT.

This is the last report of Mr. Joy after a service of a great many years as President of the company. His reports have had more than ordinary interest because, having extrordinary opportunities for observation at the head of a link in a trunk line which was compelled to maintain constant negotiations with its connections, and being a man of great ability, he has usually taken some pains to discuss current questions of railroad policy in connection with the accounts of his company. A good deal is to be learned from a file of Michigan Central reports, and probably many who are tolerably familiar with the course of railroad business would be surprised to find that some of the conclusions taught them by the events of the last few years were more than hinted at an earlier day in Mr. Joy's annual communications to his shareholders.

This report, however, is not so full as previous ones, and lacks some information which will be missed, especially the statements of earnings and expenses for each of the branch lines. However, in this respect the report formerly differed from that of most roads, though it was a difference to be applauded. It never has been particularly full, and in reporting traffic especially has been deficient, usually giving the train mileage, passenger and tonnage mileage only for the Main Line. This year, however, the train mileage is given for the whole system while only Main Line traffic is reported, and no comparison is possible, and no estimate of the average train-loads. This latter would have been especially interesting in a year when there was a large increase of freight traffic coincident with a considerable decrease of working expenses.

Main and Air Line traffic is reported, which of course is of the most importance, and has special interest for many other companies which compete or connect with the Michigan Central. It is remarkable that though the report covers the season of the great competition of 1875, when through passenger rates were $18 from New York to Chicago and $15 from Chicago to New York for a large part of the year—on the average one-fourth less than the regular rates—there was actually a *decrease* in through passenger traffic, amounting to 6½ per cent. The freight movement was greatly stimulated by the low rates, the increase in through movement being more than 14 per cent.

The total traffic was about 7 per cent. greater than the previous year, but the reduction in rates was such that there was a decrease of 3½ per cent. in gross earnings. This loss was overcome by a decrease of working expenses, so that net earnings were a trifle greater. The gross receipts have not been so small since 1871–2. The net earnings have been exceeded but twice—in 1872–3 by $267,000 and in 1873–4 by $62,400. The progress in traffic on the Main and Air Lines (for which alone it is reported) has been notable, even during these dullest of times. For a series of years it has been:

Year.	Passenger mileage.	Tonnage mileage.
1865–66	75,629,075	84,897,713
1866–67	67,924,766	91,950,418
1867–68	64,462,383	101,264,251
1868–69	68,019,438	131,827,774
1869–70	70,155,418	132,903,174
1870–71	65,500,323	190,606,687
1871–72	63,250,162	216,739,727
1872–73	69,767,295	246,078,512
1873–74	71,200,018	313,401,088
1874–75	72,826,047	318,366,003
1875–76	70,566,893	356,843,495

When we said traffic, we should have said passenger traffic. It is hard to say which is more wonderful, the extraordinary growth of the freight traffic or the extraordinary stagnation of the passenger traffic. Doubtless the former is, for the non-increase of the passenger traffic has been general; while not many railroads have made such progress in tonnage: in eleven years it has multiplied more than four-fold. The increase since the panic has been more than the total freight traffic of 1867–68. But it has availed the stockholders little. The gain in traffic is accompanied by such reductions in rates that profits are most unsatisfactory. The average receipt per ton per mile, for a series of years, has been:

1864–65	3.06	1870–71	1.61
1865–66	2.60	1871–72	1.56
1866–67	2.49	1872–73	1.57
1867–68	2.45	1873–74	1 30
1868–69	2.09	1874–75	1.16
1869–70	1.98	1875–76	1.03

Thus the rate for the last year is 12 per cent. less than in 1874–75, 20 per cent less than in 1873–74, 34 per cent. less than in 1872–73 and 1871–72 and 66 per cent. less than in 1864–65.

During the last year the average through freight rate was only 0.81 cent. per ton per mile. The average expense per ton per mile was 0.721 cent. and one of the lowest that has ever been reported—lower than on the New York Central, and a sixth higher than on the Pennsylvania for the last year reported. As this cost is only for Main Line traffic on the Michigan Central, however, a comparison cannot be made directly with roads having a great mileage of branches.

While the net earnings of the Michigan Central have not been large enough to afford a dividend for several years, there is yet a large margin above the fixed charges for interest and rentals, amounting the last year to nearly 25 per cent. That is, net earnings could be diminished 20 per cent. without infringing on the sums required to meet the interest on the Main Line and branch bonds.

It is also somewhat encouraging to see that there was last year a considerable increase (25½ per cent.) in the net earnings of the leased branches.

Nothing but reasonable rates is needed to restore this road to prosperity. A quarter of a cent more per ton per mile last year would have added about $900,000 to its net income and enabled it to pay 6 or 7 per cent. on its capital stock. That such an increase (which would not make the rate equal to that of 1873–74) is probable, we would not dare to say. That it is possible with a fair degree of harmony among the carriers, there is every reason to believe.

The Grain Movement for Fourteen Weeks.

The shipments of grain of all kinds from the eight principal Northwestern markets for each week since April 22 have been, in bushels, by lake and by rail:

Week ending—	By lake.	By rail.	Total.	Per ct. by rail.
April 29	1,634,541	2,072,946	3,707,487	56
May 8	2,445,191	2,292,633	4,737,824	48⅜
" 13	1,538,526	2,302,940	3,841,466	60
" 20	1,602,170	2,016,304	3,618,474	55⅝
" 27	1,747,408	1,820,456	3,567,814	51
June 3	2,412,162	1,797,922	4,210,084	42⅝
" 10	2,894,915	2,147,670	5,042,585	42½
" 17	2,921,405	2,391,811	5,313,216	45
" 24	2,728,706	2,198,054	4,926,760	44⅝
July 1	1,821,155	1,784,548	3,605,703	49⅝
" 8	1,765,010	1,205,184	2,970,194	40⅝
" 15	1,648,508	1,228,678	2,877,186	42⅝
" 22	2,269,336	1,032,825	3,302,161	31¼
" 29	1,466,502	1,038,208	2,504,710	41⅝
Total for 14 weeks	28,895,535	25,330,179	54,225,714	46⅝

The shipments for the last week fell off nearly a quarter, and this time the loss fell on the vessels, the railroads carrying nearly the same as the week before, though less than in any previous week since navigation opened. A large fleet is now tied up in Chicago and Milwaukee for lack of cargoes. There is very little grain left to ship at lake ports; but if the railroads had carried only the usual amount, enough would have been left to keep the vessels moving until the new crop comes forward.

The receipts at Atlantic ports for the same fourteen weeks were:

	Corn.	Per cent. of total.	All grains.	Per cent. of total.
New York	8,852,570	29.8	27,777,953	47.3
Boston	3,125,875	10.5	4,284,989	7.3
Portland	257,300	0.9	572,770	1.0
Montreal	1,276,574	4.3	5,594,893	9.6
Philadelphia	7,671,200	25.8	10,534,550	17.9
Baltimore	7,149,900	24.1	8,231,385	14.0
New Orleans	1,365,809	4.6	1,759,819	2.9
Total	29,699,228	100.0	58,755,459	100.0

New York continues to get a larger share of the grains, especially of corn, than earlier in the season, and gains on Philadelphia and Baltimore. During the last week (ending July 29) New York received 44¼ per cent. of the total seaboard corn receipts, Philadelphia 17 per cent., Baltimore 14⅛ per cent., Boston 14⅛ per cent. Of the receipts of all grains the percentages at different ports were: New York, 49.6 per cent.; Philadelphia, 14.7 per cent.; Montreal, 10.4 per cent.; Boston, 9.8 per cent.

There is no longer an unusual movement in grain, though it is perhaps as great as could be expected at this season.

The Grain Movement of the Crop-Year.

The crop-year for grain in the Northwest and the East begins in August, that being probably the best date for small grains, but not for corn, as all the corn marketed for several months yet will be that grown in 1875. Perhaps the calendar year would be as good as any for the corn year; but there is less objection to dating from August 1 for corn because most of the old corn is marketed before that time—at least is out of the farmers' hands by that time.

We give our usual statement of receipts and shipments of grain for the seven months ending with July, showing in grains of all kinds a very large increase this year over last—20⅓ per cent. in receipts at Northwestern markets, 33 per cent. in their shipments, and no less than 47⅞ per cent. in the receipts at Atlantic ports.

Not only has there been an enormous increase in the total grain movement of the seven months as compared with last year, but in everything except Northwestern receipts the movement has been greater than ever before, exceeding that of 1874, which up to that time was the greatest. The following gives the movement of grain of all kinds for the seven months for four years:

	1876.	1875.	1874.	1873.
Northwestern receipts	86,653,307	71,835,461	98,907,361	80,953,123
" shipments	77,979,567	57,148,423	73,727,156	62,680,474
Atlantic ports' receipts	92,071,811	62,348,857	81,554,948	57,644,530

Thus though the reported receipts at lake ports were 12¾ per cent. less this year than in 1874, the lake ports' shipments were 6 per cent. more and the Atlantic ports' receipts 13 per cent. more than in that extraordinary year.

We will now examine the movement of the crop year, closing with July. The receipts of the eight leading Northwestern markets for that year for four years have been:

	1875–6.	1874–5.	1873–4.	1872–3.
Flour	5,070,005	5,312,865	6,203,989	5,781,225
Wheat	64,541,491	64,906,024	84,298,228	54,633,138
Corn	61,719,483	46,396,325	68,028,352	62,523,240
Oats	28,119,918	22,369,415	26,867,098	29,143,324
Barley	7,503,924	5,739,988	6,017,896	9,129,913
Rye	2,499,560	1,196,010	1,774,711	1,901,338
Total, grain	164,384,376	140,607,762	183,986,287	157,430,963
Flour reduced to wheat	25,350,025	26,564,325	31,079,945	28,926,125
Grand total	189,734,401	167,172,087	215,066,232	186,357,078

Compared with the previous year the receipts for 1875–76 show a decrease of 4.6 per cent. in flour and of 0.5 per cent. in wheat, an increase of 33 per cent. in corn, of 25.5 per cent. in oats, of 30.7 per cent. in barley, and of 108.6 in rye. In grain of all kinds the increase was 17 per cent., and in grain and flour together it was 13.5 per cent. In the latter, the receipts of the last crop year were 12¼ per cent. less than in 1873–74 (the greatest of grain years for the Northwest), and 1.8 per cent. more than in 1872–3.

The *weight* of the grain and flour receipts at these great primary markets was about 4,860,000 tons, thus making 486,000 full car-loads. Loaded into ordinary freight cars coupled together this would extend something over 3,000 miles. Hauled an average distance of 200 miles at an average rate of 1¾ cents per ton per mile, the carrying of this grain to the Northwestern ports only would earn $17,010,000.

This grain traffic is still the great business of some Northwestern railroads, but the tendency is, except in a few sections where stock growing is exceptionally costly or grain-growing exceptionally successful, for farmers to turn their attention more and more from grain-growing and to devote more of their land and labor to other products, which return greater average profits and cost less for transportation. This tendency is not visible so much in the new districts most distant from markets which suffer most from the cost of transportation, as one might expect it to be, but chiefly in the country which has been occupied some fifteen or twenty years; the reason being that these other industries—especially stock growing and dairy business—require a considerable capital in addition to that invested in the lands and fences, and this capital the settler in the new country very rarely can command. That is, the man most distant from market raises the crop which is most reduced in value by that distance because he cannot raise anything else with the means at his command.

This does not mean that the grain crops grow less; the growth of the country and the occupation of hitherto unplowed lands in the older States, which goes on continually, prevent that; but the proportion of grain to other crops does grow less in most of the Northwestern States, and grows less as the farmers grow rich.

Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

Cincinnati Southern.—The first track is laid from Ludlow, Ky., south 25 miles.

Wyandotte, Kansas City & Northwestern.—Extended northwest 5 miles to Lexington, Mo. It is of 3 ft. gauge.

Central Pacific.—The *Berkeley Branch* is completed from Oakland, Cal., to Berkeley, 6 miles.

This is a total of 36 miles of new railroad, making 1,046 miles completed in the United States in 1876, against 594 miles reported for the same period in 1875, 913 in 1874, 1,966 in 1873 and 3,372 in 1872.

California Wheat has to make a voyage of something like 13,000 miles to reach a market. Nearly all of it goes to Europe, and all that goes to Europe is taken around Cape Horn. This distance is something like three times that of the Northwestern grain districts from the European market; besides which must be reckoned the distance of the California wheat fields from the sea. One might think that this distance would prohibit shipments; but really it has comparatively little effect. The quotations for cargoes from San Francisco to Liverpool show rates from 16d. to 19d. per bushel—7d. to 10d. more than the rate from New York to Liverpool. Current rates from Chicago, ridiculously low as they are, will reduce this difference so that the cost from San Francisco to Liverpool is but 3d. to 6d. more than from Chicago to Liverpool. The San Francisco rate is something like 0.005 cent. per ton per mile.

July Earnings, reported down to this time by eleven companies, compare unfavorably with those of last year. Seven of the eleven, it is true, show an increase, but the increases are mostly small and amount to but $130,000 against $426,000 of decreases. There are too few reports as yet to justify a conclusion.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

Hannibal & St. Joseph.—Mr. W. B. Pickett has been appointed Purchasing Agent, with office at Hannibal, Mo.

Jacksonville, Pensacola & Mobile.—Maj. Edgar Vliet has been appointed General Freight and Ticket Agent, in place of W. M. Cowgill, resigned.

St. Louis & Southeastern.—Mr. E. Young has been appointed Auditor, in place of J. P. Hains, resigned.

Western, of Alabama.—Mr. H. M. Abbett has been appointed Auditor, in place of H. W. Crittenden, resigned.

Pine River Valley & Stevens Point.—The officers of this company are as follows: President, George Krouskop; Secretary, A. C. Eastland; Superintendent, N. L. James; Chief Engineer, E. Baldwin. The offices are at Richland Center, Wis.

Atlantic & St. Lawrence.—At the annual meeting in Portland, Me., Aug. 1, the following directors were chosen: John B. Brown, Charles E. Barrett, Harrison J. Libby, Franklin R. Barrett, Samuel E. Spring, Francis K. Swan, Joseph Dickson, Alexander T. Galt, Charles J. Brydges. The road is leased to the Grand Trunk.

Watertown & Waterbury.—Mr. W. D. Bishop has been chosen President in place of O. B. King, resigned. The road is leased to the Naugatuck Company.

Massachusetts Railroad Commission.—Mr. J. H. Goodspeed has been appointed by the Railroad Commissioners of Massachusetts Supervisor of Accounts of Railroad Corporations, under the provisions of the act passed by the last Legislature last winter. He entered upon his duties Aug. 1. At the time of his appointment he was holding the position of General Auditor of the roads generally known as the "Joy roads" of the West.

Davenport & Northwestern.—The officers of this company, organized by the bondholders who bought the Davenport & St.

Paul, are as follows: President, L. H. Meyer, New York; General Manager, John E. Henry, Davenport, Ia.; Treasurer, H. Rutlen, New York.

Lexington & St. Louis.—The new board of directors has chosen the following officers: President, Thos. F. Huston; Vice-President, Wm. Morrison; Secretary, James Wentworth; Attorney and Fiscal Agent, Col. Thos. P. Akers; Treasurer, S. G. Wentworth.

Chicago, Dubuque & Minnesota.—Mr. C. H. McArthur is appointed Auditor in place of F. J. Massey.

Indianapolis, La Por.e & Michigan City.—At the annual meeting in Michigan City, Ind., Aug. 1, the following directors were chosen: H. H. Walker, Michigan City, Ind.; Jesse Zorn, Peru, Ind.; David Macy, V. T. Malott, A. B. Southard, Indianapolis; Wm. Cutting, Hayward Cutting, New York. The road is controlled by the Indianapolis, Peru & Chicago.

Texas & Pacific.—Mr. H. T. Peake has been appointed Acting Division Superintendent of the Transcontinental Division, with office in Sherman, Texas.

Michigan Central.—The Chicago *Tribune* says that Mr. J. Q. A. Bean is to be General Freight Agent. Mr. Bean was formerly connected with the Chicago, Burlington & Quincy, and is now General Eastern Agent for the Michigan Central and Great Western.

Louisville, Cincinnati & Lexington.—Mr. John McLeod, for some time past General Superintendent of this road, is appointed Receiver in place of his father, Mr. George McLeod, who retires on account of continued ill-health.

Springfield, Athol & Northeastern.—At the annual meeting in Athol, Mass., Aug. 1, the old board was re-elected as follows: Wm. Birnie, Homer Foote, W. B. Kimball, Charles B. Ladd, Willis Phelps, Springfield, Mass.; Thomas H. Goodspeed, John C. Hill, Athol, Mass.; Samuel Adams, New Salem, Mass.; J. W. Goodman, Dana, Mass.; Stephen P. Bailey, Greenwich, Mass.; Edward Smith, Enfield, Mass.

Pennsylvania Transportation Company.—The officers of this company now are: President, Henry Harley; Vice-President, J. F. Jones; Treasurer, C. W. Batchelor; Secretary, Wm. H. Abbott; Chief Engineer, Herman Haupt; General Superintendent, Wm. Warmcastle; Counsellors, Joshua Douglas, Meadville, Pa.; F. Carroll Brewster, Philadelphia; Benjamin F. Butler, Lowell, Mass. This is the company which purposes building pipe lines from the Pennsylvania oil regions to Baltimore, Philadelphia and New York.

Baltimore & Ohio.—Mr. A. J. Fairbanks, Agent at Mount Clare, has been appointed General Agent at Camden Station, Baltimore, in place of Mr. Oliver Hoblitzell, resigned.

Indianapolis, Cincinnati & Lafayette.—The United States Circuit Court has appointed Mr. M. E. Ingalls Receiver, on application of some of the bondholders. Mr. Ingalls is President of the company.

Eastern Kentucky.—Capt. George Gibbs has been appointed Superintendent, in place of J. M. L. Staughton, resigned. The change will take place Sept. 1. Captain Gibbs is Superintendent of the Millard Coal & Iron Company.

Pekin, Lincoln & Decatur.—Mr. R. A. Bunker, late of the Springfield & Northwestern, has been appointed Auditor and Cashier, with office in Pekin, Ill.

Carolina Central.—Mr. V. Q. Johnson, Assistant Superintendent, is Acting Superintendent, in place of Col. S. L. Fremont, resigned.

TRAFFIC AND EARNINGS.

Coal Movement.

Reports of coal tonnage for the seven months ending July 29 are as follows:

Anthracite:	1876.	1875.	Inc. or Dec.	P.c.
Philadelphia & Reading	2,181,395	1,540,450	Inc.. 640,945	41.6
Northern Cent., from Shamokin Div., and Summit Br'h	464,163	673,610	Dec.. 209,447	31.1
Danville, Hazleton & Wilkesbarre	23,724	41,954	Dec.. 18,240	43.4
Central of N. J., Lehigh Div.	1,185,076	631,131	Inc.. 553,945	87.8
Lehigh Valley	1,813,188	987,617	Inc.. 825,571	83.6
Pennsylvania & New York	14,003	66,003	Dec.. 52,000	78.6
Pennsylvania Canal	179,629	65,095	Inc.. 114,534	17.6
Del., Lackawanna & West'n.	753,879	1,790,734	Dec..1,036,855	57.9
Delaware & Hud. Canal Co.	1,016,013	1,840,629	Dec.. 824,616	44.8
State Line & Sullivan	26,629	5,557	Inc.. 21,072	379.2
Pennsylvania Coal Co	507,668	744,699	Dec.. 237,031	31.8
Total anthracite	8,165,367	8,387,489	Dec.. 222,122	2.6
Semi-Bituminous:				
Cumberland, all lines	968,684	1,280,445	Dec.. 311,761	24.3
Huntingdon & Broad Top	90,855	127,110	Dec.. 36,255	28.5
East Broad Top	40,660	26,426	Inc.. 14,234	53.9
Tyrone & Clearfield	676,080	491,487	Inc.. 184,593	37.6
Bellefonte & Snow Shoe	31,260	40,203	Dec.. 8,943	22.2
Total semi-bituminous	1,807,539	1,965,671	Dec.. 158,132	8.0
Bituminous:				
Barclay	186,819	173,920	Inc.. 12,899	7.4
Allegheny Region, Pa. R. R.	118,410	137,164	Dec.. 18,754	13.7
Penn and Westmoreland gas coal	428,983	331,728	Inc.. 97,255	29.3
Pittsburgh Region, Pa. R. R.	160,280			
West Pennsylvania R. R.	112,915	355,325	Dec.. 48,411	13.6
Southwest Penn. R. R.	33,719			
Total bituminous	1,041,126	998,137	Inc.. 42,989	4.3
Coke:				
Penn and Westmoreland	26,103			
West Pennsylvania R. R.	26,610			
Southwest Penn. R. R.	278,865			
Pittsburgh Region, Pa. R. R.	102,042			
Total coke	433,620	404,612	Inc.. 29,008	7.2

The anthracite coal tonnage of the Belvidere Division, Pennsylvania Railroad, for the seven months ending July 29 was as follows:

	1876.	1875.	Inc. or Dec.	P.c.
Coal Port for shipment	134,923	29,861	Inc.. 105,062	351.8
South Amboy for shipment	238,948	50,783	Inc.. 188,165	370.5
Local distribution on New Jersey lines	84,498	90,428	Dec.. 5,930	6.5
Company's use	32,692	8,960	Inc.. 23,732	264.9
Total	491,061	180,032	Inc.. 311,029	172.8

Of the total in 1876, 328,898 tons were from the Lehigh and 162,163 tons from the Wyoming region.

Chicago Lumber Traffic.

Receipts and shipments for seven months, from Jan. 1 to Aug. 2, have been:

Lumber:	1876.	1875.	Decrease.	P. c.
Receipts	475,166,678	535,554,192	60,387,514	11.3
Shipments	276,916,145	308,031,784	31,115,639	10.1
Shingles:				
Receipts	298,001,000	326,829,700	28,828,700	8.8
Shipments	112,264,300	151,397,425	39,133,125	13.5

Of the receipts, 8.4 per cent. was by rail this year and 8.1 per cent. last year.

The Winter Port of Canada.

Since the Intercolonial Railway has been opened there has been much talk about making Halifax, N. S., a leading winter port for Canada. A strong effort will probably be made the coming season to induce shipments by that port rather than by Portland, Me. The subject was discussed at a recent meeting of the Halifax Chamber of Commerce. Mr. Brydges, General Superintendent of Government Railways, who was present, promised that the road would give all needed facilities to Halifax and all possible concessions on through rates. He believed that fair arrangements could be made with steamer lines; he also thought that the Grand Trunk would not try to discriminate against the Intercolonial.

Railroad Earnings.

Earnings are reported for the following periods:

Year ending June 30:	1875-'76.	1874-'75.	Inc. or Dec.	P. c.
Atlanta & West Point	$283,498	$292,718	Dec.. $9,220	3.1
Expenses	183,905	185,748	Dec.. 1,843	1.0
Net earnings	$99,593	$106,970	Dec.. $7,377	6.9
Earnings per mile	3,259	3,365	Dec.. 106	3.1
Per cent. of expenses	64.87	63.46	Inc.. 1.41	2.2
Springfield, Athol & Northeastern	105,726	96,806	Inc.. 8,920	9.2
Expenses	75,893	61,672	Inc.. 14,221	23.0
Net earnings	$29,833	$35,134	Dec.. $5,301	15.1
Earnings per mile	2,180	1,996	Inc.. 184	9.2
Per cent. of expenses	71.80	63.71	Inc.. 8.09	12.7

Seven months ending July 31:	1876.	1875.		
Atlantic & Pacific	$699,898	$647,151	Inc.. $52,747	8.2
Canada Southern	935,794	622,846	Inc.. 312,948	50.2
Central Pacific	9,408,000	9,446,408	Dec.. 38,408	0.4
Chicago & Alton	2,643,970	2,500,411	Inc.. 143,559	5.7
Chicago, Milwaukee & St. Paul	4,645,938	4,234,836	Inc.. 411,102	9.7
Illinois Central	4,030,604	4,201,975	Dec.. 171,371	4.1
Missouri, Kan. & Texas	1,642,146	1,440,750	Inc.. 201,396	14.0
Ohio & Mississippi	2,095,415	1,828,220	Inc.. 267,195	14.6
St. Louis, Alt. & T. H., Belleville Line	263,610	313,839	Dec.. 50,229	16.0
St. Louis, Iron Mountain & Southern	1,972,886	1,869,190	Inc.. 103,696	5.5
St. Louis, Kansas City & Northern	1,717,202	1,388,839	Inc.. 328,863	23.7

Six months ending June 30:				
Burlington & Missouri River in Nebraska	$341,657	$251,761	Inc.. $89,896	35.7
Expenses	153,000	137,468	Inc.. 15,532	11.3
Net earnings	$188,657	$114,293	Inc.. $74,364	65.1
Per cent. of expenses	44.78	54.59	Dec.. 9.81	17.9
Chicago, Bur. & Quincy	5,685,578	5,462,781	Inc.. 222,797	4.1
Expenses	2,994,534	2,876,814	Inc.. 117,720	4.1
Net earnings	$2,691,044	$2,585,967	Inc.. $105,077	4.1
Per cent. of expenses	52.67	52.66	Inc.. 0.01	....
Cleveland, Mt. Vernon & Delaware	184,200	205,995	Dec.. 21,795	10.6
Expenses	148,172	162,140	Dec.. 13,968	8.6
Net earnings	$36,028	$43,855	Dec.. $7,827	17.8
Per cent. of expenses	80.44	78.71	Inc.. 1.73	2.2
Flint & Pere Marquette	480,117	517,670	Dec.. 37,553	7.3
Expenses	296,037	368,902	Dec.. 72,865	19.8
Net earnings	$184,080	$148,768	Inc.. $35,312	23.7
Per cent. of expenses	61.66	71.26	Dec.. 9.60	13.5
Houston & Tex. Central	1,311,610	1,094,785	Inc.. 216,825	19.8
Expenses	949,041	945,701	Inc.. 3,340	0.4
Net earnings	$362,569	$149,084	Inc.. $213,485	143.2
Per cent. of expenses	72.36	86.38	Dec.. 14.02	16.2
Kansas Pacific	1,364,057	1,492,664	Dec.. 128,607	8.6
Expenses	877,904	840,804	Inc.. 37,100	4.4
Net earnings	$486,153	$651,860	Dec.. $165,707	25.4
Per cent. of expenses	64.36	56.33	Inc.. 8.03	14.3
Mobile & Ohio	857,010	783,335	Inc.. 73,675	9.4
Paducah & Memphis	106,054	91,878	Inc.. 14,176	15.4
Expenses	73,248	65,928	Inc.. 7,320	11.1
Net earnings	$32,806	$25,950	Inc.. $6,856	26.4
Per cent. of expenses	69.04	71.74	Dec.. 2.70	3.8
St. Louis, Iron Mt. & Southern	1,719,386	1,642,949	Inc.. 76,437	4.7
Expenses	939,635	964,258	Dec.. 24,573	2.5
Net earnings	$779,701	$678,691	Inc.. $101,010	14.9
Per cent. of expenses	54.65	58.69	Dec.. 4.04	6.9
St. Louis & Southeastern	507,643	479,265	Inc.. 28,378	5.9
Expenses	430,497	435,646	Dec.. 5,149	1.2
Net earnings	$77,146	$43,619	Inc.. $33,527	76.9
Per cent. of expenses	84.81	90.89	Dec.. 6.08	6.7

Month of May:				
Denver & Rio Grande	$34,119	$35,536	Dec.. $1,417	4.0
Expenses	21,391	17,190	Inc.. 4,201	24.4
Net earnings	$12,728	$18,346	Dec.. $5,618	30.7
Per cent. of expenses	62.69	48.42	Inc.. 14.27	29.5

Month of June:				
Mobile & Ohio	$85,831	$89,938	Dec.. $4,107	4.6
Toronto, Grey & Bruce	32,692	27,410	Inc.. 5,282	19.3

Month of July:				
Atlantic & Pacific	$88,600	$84,400	Inc.. $4,200	5.0
Canada Southern	108,787	104,897	Inc.. 3,890	3.7
Central Pacific	1,507,000	1,536,225	Dec.. 29,225	1.9
Chicago & Alton	397,260	387,445	Inc.. 9,824	2.5
Chicago, Milwaukee & St. Paul	685,753	842,395	Dec.. 156,642	18.6
Illinois Central	482,003	715,899	Dec.. 233,896	32.5
Missouri, Kan. & Texas	224,308	211,735	Inc.. 12,573	6.5
Ohio & Mississippi	247,646	239,156	Inc.. 8,490	3.6
St. Louis, Alton & Terre Haute, Belleville Line	29,538	35,753	Dec.. 6,215	17.3
St. Louis, Iron Mt. & Southern	253,500	226,341	Inc.. 27,259	12.1
St. Louis Kansas City & Northern	216,917	153,497	Inc.. 63,420	41.3

Third week in July:				
Cairo & St. Louis	$4,517	.....	.....	....
Denver & Rio Grande, Main Line	6,933	$4,075	Inc.. $2,858	70.1
Denver & Rio Grande, Trinidad Extension	1,807	.....	.....	....
St. Louis & Southeast'n	23,616	15,346	Inc.. 8,270	54.1

Week ending July 21:				
Great Western, of Canada	£13,397	£14,753	Dec.. £1,356	9.2

Week ending July 22:				
Grand Trunk	£33,500	£36,300	Dec.. £2,800	7.7

Erie Canal.

The business of the canal at Buffalo for the period from the opening of navigation up to July 31 was as follows:

	1876.	1875.	Decrease.	P.c.
Tolls received	$257,083 04	$296,827 46	$39,744.42	13.4
Number of boats cleared	2,136	2,340	204	8.7

The canal opened May 4 in 1876, and May 18 in 1875.

Ocean Rates.

Ocean rates were pretty steady during the two weeks ending with Tuesday until about the 4th inst., when steamer rates especially gave way. Quotations have been: Grain, from New York to Liverpool, 8d. to 10½d. by steam, and from 7⅞ to 9d. by sail. The steamer rate was 10½ on the 3d, fell to 8⅛ on the 4th, and was 8d. to 8½d. till the 8th, when it rose to 9d. From New York to Cork, for orders, rates have varied between 8¾d. and 9¾d., closing at 9d. From Baltimore to Cork, for orders, the rates reported are 9¾d. to 10¼d. From New York to Liverpool by steam, cheese has been taken at 50s. to 55s., and bacon at 40s. per ton, and compressed cotton at 9-32d. to 5-16d. per pound. Petroleum freights from New York have been quoted at 4s. 6d. per barrel to Bremen, 6s. to the Baltic, 5s. 3d. to Newcastle, 5s. to Marseilles. From Philadelphia to Bremen, 6s. 3d., and from Richmond to the Baltic, 6s. The San Francisco *Bulletin*, of July 26, says: "There is an abundance of tonnage, and wheat charters are nominal at 50s. to 60s." These rates are per ton.

Grain Movement.

For the week ending July 29 receipts and shipments of grain of all kinds are reported as follows, in bushels:

	1876.	1875.	Inc. or Dec.	P. c.
Lake ports' receipts	2,983,881	4,424,392	Dec..1,440,511	32.6
Lake ports' shipments	2,504,710	3,728,180	Dec..1,223,470	32.8
Atlantic ports' receipts	2,621,248	2,287,218	Inc.. 334,030	14.6

Of the shipments from lake ports for the week, 41¼ per cent. was by rail this year, against 26¼ per cent. in 1875 and 19¾ in 1874.

For the seven months from Jan. 1 to July 29 receipts and shipments are reported as follows:

Flour:	1876.	1875.	Inc. or Dec.	P.c.
Lake ports' receipts	2,935,768	2,658,885	Inc.. 276,883	10.4
" " shipments	3,127,303	2,803,743	Inc.. 323,560	11.6
Atlantic ports' receipts	5,141,011	5,131,758	Inc.. 9,253	0.2
Wheat:				
Lake ports' receipts	26,444,496	30,381,288	Dec.. 3,936,792	13.0
" " shipments	24,887,132	26,600,946	Dec.. 1,713,814	6.4
Atlantic ports' receipts	25,475,469	22,971,301	Inc.. 2,504,168	10.9
Corn:				
Lake ports' receipts	42,404,348	27,736,509	Inc..14,667,838	52.9
" " shipments	38,806,346	21,666,232	Inc..17,142,114	79.2
Atlantic ports' receipts	50,093,579	29,329,479	Inc..20,764,100	70.8
Grain of All Kinds:				
Lake ports' receipts	86,653,307	71,835,461	Inc..14,817,846	20.6
" " shipments	77,979,567	57,148,423	Inc..20,831,144	33.0
Atlantic ports' receipts	92,071,811	62,348,857	Inc..29,722,954	47.6

Buffalo flour and grain receipts for the seven months ending July 31 were as follows, flour in barrels and grain in bushels:

	Flour.		Grain.	
	1876.	1875.	1876.	1875.
By lake	286,598	418,239	19,655,217	20,686,257
By rail	635,200	378,300	7,677,800	4,953,200
Totals	921,798	796,529	27,333,017	25,639,457

The increase in flour this year is 15.7 per cent.; in grain, 6.2 per cent. Of the flour 68.9 per cent. and of the grain 28.1 per cent. came by rail this year. Shipments eastward of grain for the same period were:

	1876.	1875.	Inc. or Dec.	P.c.
By rail, bushels	6,337,503	5,790,474	Inc..547,029	9.4
By canal	12,372,620	12,800,106	Dec..427,486	3.3
Totals	18,710,123	18,590,580	Inc..119,543	0.6

The rail shipments were 33.9 per cent. of the total in 1876, and 31.1 per cent. in 1875. The canal was open two weeks longer this year than last.

Chicago receipts and shipments for the week ending Aug. 5 were:

	1876.	1875.	Increase.	P. c.
Receipts	1,348,329	1,186,860	161,469	13.6
Shipments	1,979,607	1,460,308	519,299	35.5

The movement was exceptionally light during this week last year, which accounts for the increase. Compared with the previous week this year, receipts were 12 per cent. less and shipments 22½ per cent. more.

Railroad Traffic.

Shipments of through freight eastward over the Central Pacific in June were as follows:

	1876.	1875.	Increase.	P.c.
San Francisco, tons	6,240	.....	.....	....
Interior points	381	.....	.....	....
Total	6,621	4,420	2,201	49.8

The leading items this year were 3,225 tons wool, 1,746 tons tea and 637 tons salmon. Tea shipments were unusually large. For the six months ending June 30 the shipments of the leading articles of freight were: wool, 10,409 tons: tea, 4,056 tons; barley, 2,202 tons; wine, 1,300 tons; salmon, 1,257 tons.

During July there were received at and forwarded from Indianapolis by the railroads entering that city 44,897 freight cars, of which 27,727 were loaded.

Petroleum Movement.

The exports from Boston, New York, Philadelphia and Baltimore from Jan. 1 to July 29 have been for four years, in gallons:

	1876.	1875.	1874.	1873.
New York	67,053,942	80,428,213	88,319,698	75,486,768
Boston	1,444,288	1,503,744	1,948,550	1,305,009
Philadelphia	34,153,242	26,525,736	45,383,011	44,042,914
Baltimore	21,463,595	15,191,970	2,809,963	1,902,869
Total	124,115,067	123,649,663	138,461,222	122,737,560

There is thus little difference in the total exports in the four years, except that in 1874 the exports were 11¼ per cent. greater than this year. But there are great changes in the exports of different ports. New York, which exported 61½ per cent. of the total in 1873, 64 per cent. in 1874, and 65 per cent. in 1875, has exported but 54 per cent. this year. Philadelphia, which last year seemed in a way to lose its petroleum business, shipping nearly 60 per cent. less than in 1874, has increased this year, largely; while Baltimore, which was taking Philadelphia's business last year, has been taking New York's this year. In 1873, while 61½ per cent. of the exports was at New York, 36 per cent. were at Philadelphia and only 1⅞ per cent. at Baltimore. This year 54 per cent. is at New York, 27⅝ per cent. at Philadelphia and 17⅛ per cent. at Baltimore. New York exports nearly a quarter less than in 1874, and Philadelphia also, while Baltimore exports nearly eight times as much.

Lake and Canal Freights.

The Buffalo *Commercial Advertiser* says: "The depression in the lake transportation business continues without any fair signs of improvement. The average rate last month was 1.9 cents on wheat from Chicago to Buffalo, which is the lowest point yet reached. The following comparative statement, giving the average rate on wheat and corn from Chicago to Buffalo by lake, and the average by canal hence to New York for the month of July in the past ten years, will convey a good idea of the condition of the transportation business by water this season:

	Lake.		Canal.	
Years.	Wheat. cents.	Corn. cents.	Wheat. cents.	Corn. cents.
1867	5.5	4.1	13.7	11.7
1868	7.8	6.6	14.1	11.6
1869	5.0	4.8	14.0	12.6
1870	5.0	4.7	9.4	9.3
1871	6.2	5.7	11.8	10.8
1872	9.6	8.8	12.0	11.0
1873	6.5	5.6	10.6	9.6
1874	3.1	2.1	9.0	8.0
1875	2.8	2.6	7.5	6.9
1876	1.9	1.7	5.9	5.4

"There has been no let-up to the dullness, no bright spot in

the entire month. The opening rate at Chicago was 2¼ cents. By the 11th 2 cents had been reached; before the middle the published rate had settled to 1¾ cents on wheat and 1¼ cents on corn, from which there was no reaction. Were it not that the peculiar necessities and condition of the lake business compel some owners to keep their property moving, the lakes would be free from vessels in a very short time, as there is no profit in the prevailing rates.

"The canal business is in a similar condition. The average on wheat to New York for July was 5.9 cents, out of which over three cents a bushel goes to the State in the shape of tolls, leaving the poor boatman less than three cents for his services. It should be remembered also that this meagre sum must pay the expenses for the return trip as well as the down voyage. The up-freight business this season does not amount to anything worth mentioning. It is plain that the outlay must be in excess of the receipts."

Delaware Peach Traffic.

The total shipments of peaches passing Wilmington, Del., up to Aug. 3 were 59 cars. The regular peach trains began running Aug. 7, but are not very large as yet. The bulk of the shipments are now coming from the Kent County, the Queen Anne's & Kent and the Dorchester & Delaware roads.

ANNUAL REPORTS.

Michigan Central.

The report is for the year ending with May, 1876, during which the length of road worked was the same as the previous year, that is, 284 miles of Main Line between Chicago and Detroit (14 miles of it from Chicago to Kensington, used in common with the Illinois Central, which owns it), and 519.72 miles in branches, or 803.72 miles in all. There are 72¼ miles of second track and 144 miles of sidings on the Main Line, and 58¼ miles of sidings on the branches; or 1,078.72 miles of track altogether. Of this 329 miles were laid with steel rails. The branches are all leased. The road actually owned is 270 miles, including 486¼ miles of track, 310.86 miles of which are steel. The equipment includes 213 locomotives, 78 first-class and 290 second-class passenger and baggage cars, 8 combined passenger and baggage cars, 3 postal, 35 combined baggage and mail cars, and 1 dining car (154 passenger-train cars in all); 107 conductors' cars, 270 stock, 219 double-deck, 1,641 merchandise, 498 combination, 873 Blue Line, 6 refrigerator and 1,304 platform cars (4,918 freight-train cars); 1 inspection car, 1 paymaster's, 2 derrick and 1 pile-driver car, (5 service cars). There are two more locomotives and 11 less cars than at the beginning of the year. Besides this property, the company has claims against its leased branches for $4,588,204 expended on them for construction, owns securities which have cost $724,178, has $585,000 in the bonds of the equipment bond trustees, and has debts due from two other railroads amounting to $324,194.

This property is represented by:

Capital stock ($69,400 per mile)	$18,738,204
Mortgage bonds ($49,019 per mile)	13,235,000
Total ($118,419 per mile)	$31,973,204

A floating debt of about $950,000 is about offset by cash, accounts due, and material account, not included in the property described above. Of the mortgage debt, $1,900,000 is on the Air Line, which is a leased road. Omitting this, the funded debt is at the rate of $41,982 per mile of road owned. The yearly interest account is about $3,411 per mile of road owned. This does not include the obligations on account of leases. The rentals, which are mainly in the form of interest paid on bonds of leased lines and the interest on a small amount of other guaranteed bonds, amount to $728,112.50 per year.

No returns of the work done on the whole system worked are given in the report, except that of train mileage, and this apparently gives train mileage of the whole system for the last year and certainly for the Main and Air Lines only for the preceding year, the figures being:

Train mileage—	1876.	1875.
Passenger	1,817,970	1,028,171
Freight	2,936,445	2,390,323
Switching	1,576,872	1,337,793
Other	286,143	259,328
Total	6,617,430	5,015,615

The total earnings and expenses of the entire 803¾ miles worked have been:

Earnings:	1876.	1875.	Decrease.	P.c.
Passenger	$2,138,233 41	$2,318,998 66	$180,765 25	7.8
Freight	4,417,275 52	4,447,838 69	30,563 17	0.7
Miscellaneous	295,455 13	335,449 06	39,993 93	11.9
Total	$6,850,964 06	$7,102,286 41	$251,322 35	3.54
Expenses:				
Working	4,636,225 73	4,847,724 20	211,498 47	4.3
Taxes	166,676 50	220,373 56	53,697 06	24.4
Total	$4,802,902 23	$5,068,097 76	$265,195 53	5.2
			Increase.	
Net earnings	$2,048,061 83	$2,034,188 65	$13,873 18	0.7
Per mile.				
Gross earnings	8,524	8,836	Dec..312	3.5
Expenses	5,975	6,306	Dec..331	5.2
Net earnings	2,549	2,530	Inc .. 19	7
Per cent. of expenses..	67.67	68.25	...	...
" " ex. and taxes.	70.10	71.35	...	..

As the interest and rentals payable for the whole property were at the rate of $2,052 per mile of road worked, the net earnings for the year reported exceeded the fixed charges by $497 per mile, or about one quarter.

The work done on the Main and Air Lines (the Air Line serves as a second track for the Main Line) was:

	1876.	1875.	Inc. or Dec.	P. c.
Tons carried	1,858,231	1,641,280	Inc.. 216,951	13.2
Tonnage mileage	356,843,495	318,366,003	Inc..38,477,492	12.1
Passengers carried	893,279	831,489	Inc.. 61,790	7.4
Passenger mileage	70,566,893	72,826,047	Dec.. 2,259,154	3.1

Reckoning a passenger mile equal to two ton-miles, the total main line traffic was 7 per cent. greater in the latter year, there being a large increase in the freight traffic (12 per cent.) and a small decrease (3 per cent.) in passenger traffic.

The earnings and expenses of the Main and Air Lines were:

Earnings:	1876.	1875.	Decrease.	P. c.
Passenger	$1,718,237 87	$1,846,190 11	$127,952 24	6.9
Freight	3,727,754 18	3,754,081 43	26,327 25	7.0
Miscellaneous	250,410 45	302,908 32	52,497 87	17.3
Total	$5,696,402 50	$5,903,179 86	$206,777 36	3.5
Expenses:				
Working	$3,868,280 23	$3,960,529 98	$92,249 75	2.3
Taxes	121,805 09	180,239 20	58,434 11	32.4
Total	$3,990,085 32	$4,140,769 18	$150,683 86	3.6
Net earnings	$1,706,317 18	$1,762,410 68	$56,093 50	3.2
Per mile—				
Earnings	$14,720	$15,253	$533	3.5
Expenses	10,310	10,700	390	3.6
Profits	4,410	4,553	143	3.2

No separate statements of earnings and expenses of branch lines are made, as has been done heretofore; but the results for the aggregate (416.72 miles) may be ascertained by subtracting Main and Air Line returns from those for the whole system, giving the following:

Earnings:	1876.	1875.	Inc. or Dec.	P.c.
Passenger	$419,995 54	$472,808 55	Dec.. $52,813 01	11.2
Freight	689,521 34	693,757 26	Dec.. 4,235 92	6.1
Other	45,044 68	32,546 74	Inc .. 12,503 94	38.4
Total	$1,154,561 56	$1,199,106 55	Dec.. $44,544 99	3.7
Expenses:				
Working	767,945 50	887,194 32	Dec.. 119,248 72	13.4
Taxes	44,871 41	40,134 36	Inc .. 4,737 05	11.8
Total	$812,816 91	$927,328 58	Dec.. $114,512 67	12.4
Net earnings	341,744 65	271,777 97	Inc.. 69,966 68	25.4
Per mile—				
Earnings	2,770	2,880	Dec.. 110	3.7
Expenses	1,950	2,225	Dec.. 275	12.4
Profits	820	655	Inc .. 165	25.4

President Joy says in presenting the accounts:

"While the earnings have been about the same this year as last, the business has very largely increased over that of any former year. It has been the largest increase indeed which the road has ever had in any one year, and has been general in all classes of freight, and upon all lines. The increase in through east bound freight has been 72,800 tons. In west bound through freight, the increase has been 62,798 tons. Local east bound freight has increased 52,579 tons, and local west bound 28,774 tons. The increase in the freight upon the branches has been 93,795 tons. The total increase in through freight on the main line has been 135,508 tons, and local 83,853 tons. The whole aggregate increase of freight has been 310,746 tons. The aggregate increase of tonnage on the main line has been 216,951 tons, and the gross tonnage of the main line has been 1,858,231 tons. It may be well again for the stockholders to note the continuous increase in the business of the main line.

	Tons.
In 1870, six years ago, the whole tonnage handled was	823,770
In the next year it was	1,105,875
In 1872	1,238,313
In 1873	1,416,792
In 1874 it was	1,593,954
In 1875 it was	1,641,280
And now, in the last year	1,858,231

"It will be seen how regularly and steadily the volume of traffic has been increasing since the capacity of the road has been made adequate to the business, even through the disastrous times of the last three years.

"The results, however, of so large an increase of business have been but little more net money than from the smaller business of the year before. Indeed, as the business has increased year by year, the rates have fallen off, and so regularly and steadily that with a large annual increase in the volume of business, both the gross and the net earnings have remained for several years not far from stationary. The earnings from freight the last year, indeed, have not been as large as they were in the year which ended in May, 1873, by the sum of $188,593, though the number of tons transported have exceeded those of that year by 441,439 tons. That the company has been enabled to realize as much, and some more net results from a business nearly a third larger, has been owing to the fact that it has been possible to save money by a more economical, or rather a less expensive management. The ability to work the road so much cheaper is the result of many causes. The largest is that it has been made fully adequate to the business to be done in all its appointments. Its track is almost entirely steel rail, and requires but moderate renewals, and the prices of labor and all material used in working and maintaining equipment and track have been greatly reduced. The current working expenses therefore are at figures which seemed impossible three years ago.

"The annual report of last year contained statements showing the steady reduction of rates for ten years, and the consequences upon the earnings of the road, and the losses by reason thereof upon the business done. It will be proper again to note the results upon the business of the year of the continued reduction of rates as compared with those of only the last three years. The average rate per ton per mile in 1873 was 1.57 cents. In 1874 it fell off to 1.30 cents. In 1875 it fell to 1.16 cents.

With the rates of 1873, only three years since, on the business done the past year, the earnings from freight which were	$3,664,340 20
Would have been	5,566,758 52
Or more than were actually realized by	1,902,418 32
Which is more than two 5 per cent. dividends lost by reduction of rates in only three years.	
With the rates of 1874, the earnings of the past year would have been increased by	974,628 00
Which is lost by the reduction in the two last years.	
With the rates of only one year ago, the earnings would have been larger than they were in the past year by	475,044 34

"That stockholders may know the rates at which the respective classes of business have been done during the year, it may be stated that the average rate on east-bound business has been 82-100 cent per mile per ton. On west-bound it has been 78-100 cent per ton per mile. Average on both has been 81-100 cent per ton per mile. On local business east-bound, the average rate per ton per mile has been 2 4-100 cents per ton per mile. On local west, it has been 2 43-100 per ton per mile. The average local rate has been 2 20-100 per ton per mile.

"It will be observed that the most valuable through freight, which is merchandise of all kinds from the East to the West, is carried at the lowest rates, and that therefore the business which can afford to pay the most yields the least revenue to the railroads.

"This steady reduction of all rates, and especially of rates on west-bound business, is the result primarily of the controversy of the Boston & Albany and New York Central with the Vermont Central and Grand Trunk roads, and with the Baltimore & Ohio, and which has become intensified by the extension of the latter to Chicago about or little more than a year ago. Each of these lines furnishes a less favorable connection perhaps between Boston and the West than the more direct line of the Boston & Albany and New York Central.

"The consequences resulting from this controversy have been so detrimental to the railway property of the West, north of the Ohio and east of the Mississippi, that the managers of railroads east from Chicago last fall endeavored to obviate the difficulty on east-bound freight by an agreement among themselves to pool the whole business from Chicago upon certain agreed terms. This agreement was made under the approbation and approval of the President and Vice-President of the New York Central road, both of whom were and are in the management of the Lake Shore & Michigan Southern Railroad. By the terms of the agreement it was to continue two years. It had worked so satisfactorily to the parties that efforts were being made, with fair prospects for success, to include all roads north of the Ohio extending to St. Louis and other points, when it was abruptly terminated by the withdrawal of the Lake Shore & Michigan Southern Railroad from the agreement, and the warfare of rates and fares now existing immediately commenced. While that arrangement existed, in consequence of the larger increase of business of the Michigan Central over the other roads east from Chicago, this company paid from its earnings to the other two companies, which were short, $50,000.

* * * * * * * * *

"The floating debt created for reconstruction, steel rails, etc., of the company is $856,000, less cash to apply in New York, $156,000, leaving a total of $700,000. Last year this debt on the 31st of May was stated at $770,000. It will be remembered, however, by those who read the December semi-annual statement, that in June and soon after 4,500 tons of steel rail, which had been contracted for before the panic, were paid for in the notes of the company amounting to $435,838.80. The floating debt of June 1 of $770,000 was therefore almost at once increased to $1,205,838.80. This debt has been reduced by payments to the present amount of $700,000, being a reduction of upward of $500,000 during the year from earnings.

"There are on hand yet 2,800 tons of steel rail, which is enough to complete the main line track with steel, there being only that amount of iron left in it. These rails are all paid for, and are probably all which will be required for the year. Though in the accounts something is properly charged to construction for betterments all expenses of operating and construction have been paid from earnings. The cost of construction for the year has not been large, and is stated, so far as the items are concerned, in the report of the Superintendent. The construction account has been increased somewhat more apparently than the amount expended during the year. This is due to the adjustment of old accounts connected with reconstruction in the past, and not to any new expenditures. It was believed at the beginning of the year that the floating debt would have been extinguished, and that the company would have been in a position in January to have made some dividend to stockholders.

"The amount now standing to credit of income account is $2,247,997.32, the increase during the past year having been $608,232.18. This is larger than the net earnings of the year, after paying interest and rents, and results from the fact that there was an unusually large amount of uncollected earnings at the close of the prior year, which have come into the receipts of the present year.

"Since the removal of the treasurer's office from Boston to Detroit, which was done solely from motives of economy, there has been no office of the company except at Detroit. The stock of the company has, to some extent, become a subject of speculation, and, as is always the case in such circumstances, many unfounded rumors have been set afloat, and especially relative to the securities of the leased lines and prejudicial to their credit. With no representation in New England, where these securities have been largely held, it has not been easy to counteract their effect and save holders from unnecessary loss. The board, therefore, now avail themselves of the opportunity to state that they consider the obligations assumed by the company relative to the leased lines as sacred as any of its obligations of any description; and further, that the earnings of the company, even in these times of the impaired prosperity of the country, though they may be still further affected by a disastrous and, as they believe, unnecessary warfare among competing roads, have proved to be and continue to be such that there should be no reasonable apprehension among the holders of any of the securities direct or guaranteed by the company. With the deterioration of rates in the past, the increase of business and reduction of expenses in management have counterbalanced the losses, and with either a revival of the business prosperity of the country, and consequent increase of business even at present rates, or a cessation of the present warfare among great competing routes, there would be no doubt of the ability to earn and make reasonable dividends. Former rates, it is clear, can never be again realized, but those of one or two years ago, with peace, might be realized immediately, and with only those, and with the natural increase of business, satisfactory dividends might soon be made."

OLD AND NEW ROADS.

Chicago, Clinton & Western.

It is said that Receiver Thayer has arranged for the purchase of the iron for this road, paying therefor in the Receiver's certificates authorized by the Court. The cost of the extension of nine miles required to reach Iowa City is estimated at $40,000 in addition to the iron, and it is said that parties interested have agreed to take certificates for this amount also. With the road completed to Iowa City it is believed that considerable business can be secured.

Western Maryland.

This company has established a new freight line between Baltimore and Cumberland, Md., by its own line from Baltimore to Williamsport and the Chesapeake & Ohio Canal thence to Cumberland. Several steam canal boats have been built to ply between Williamsport and Cumberland, and freight is taken at rates below those of the Baltimore & Ohio. The disadvantages of the line are the transfer at Williamsport and its necessary stoppage in winter when the canal is closed.

Davenport & St. Paul.

The bondholders, at whose suit this road was recently sold under foreclosure of mortgage, have begun suit in the United States Circuit Court at Davenport, Ia., against the old company and its stockholders, asking that the defendants be compelled to account for all funds received from the sale of bonds and to pay the face value of about $1,255,000 of bonds and claims against the road to the amount of $1,000,000 more. The bill alleges the grossest frauds by the company, not only in the negotiation of the bonds, but in the management of the road. The plaintiffs allege that $2,400,000, proceeds of bonds, was spent in violation of the contract; that $400,000 was loaned to another company; that no rolling stock was bought except from the Western Company of which the members of the Davenport & St. Paul Construction Company were members.

The suit is of great interest, as the bondholders seek to establish an important principle.

Valley, of Virginia.

It is now stated that the Baltimore & Ohio has given the lessees of this road all necessary facilities for exchange of traffic at Harrisonburg, and has also agreed to pro-rate with them on all through passenger and freight business to or from the Chesapeake & Ohio. Most of the freight is transferred at Harrisonburg simply because the lessees of the Valley road find it more economical to use their own cars than to pay mileage on foreign cars. Free use of sidings, etc., has been allowed to the Valley road. There has been some trouble about the travel between Baltimore and the Virginia Springs, a considerable traffic at this season, but that arose entirely from the desire of the Chesapeake & Ohio to carry as much of the business as possible by way of Richmond, thus securing a greater mileage for itself.

Helena & Iron Mountain.

But 4½ miles out of the 48 between Helena, Ark., and Forrest City remain to be graded, and the bridges and trestles are well advanced. The board recently authorized President Jacks to make a new contract for iron, the former contract having lapsed on account of the failure of the Marietta Iron Company.

Atlantic & Great Western.

A suit has been begun in the Mercer County (Pa.) courts to enjoin this company from using the third or standard-gauge rail recently laid to complete the standard-gauge connection with the Shenango & Allegheny road from Cleveland. The suit is based upon the fact that the Pennsylvania charter of the road provides for a line of 6 ft. gauge only. It is begun at the instance of the Pennsylvania Company.

Indianapolis, Cincinnati & Lafayette.

After struggling for some time against its difficulties, this

road has once more passed into the hands of a receiver. A petition was filed in the United States Circuit Court at Indianapolis, last week, by Mr. George C. Hoadley, trustee under the $2,000,000 mortgage of 1869, for the appointment of a receiver pending action for the foreclosure of that mortgage. The petition set forth that the company was unable to pay its interest due Aug. 1, and was also largely indebted for wages and supplies. The petition came up for hearing Aug. 2, when the Court appointed Mr. M. E. Ingalls Receiver, and he at once filed the necessary bonds and took possession. Mr. Ingalls is President of the company and was Receiver of the road when it was before in the hands of the Court.

The United States Circuit Court at Cincinnati subsequently appointed Mr. Ingalls Receiver for so much of the road as is in Ohio, in a concurrent suit.

A circular has been issued to employes assuring them that by order of the Court the first net earnings of the road are to be applied to clearing off the four months' arrears of wages now due them.

The road has a large traffic, but it has to take nearly all of it in competition with other lines and at very low rates. It is, moreover, burdened with a very heavy capital account, especially since it was taken from the hands of the Court and the debt adjusted two years ago. It is probable that the foreclosure will now be carried out.

Connecticut Valley.

The formal abandonment of the leases of the Connecticut Central and the Springfield & New London road has been completed. No arrangement has been made for the permanent operation of the last-named road or its lease to the Connecticut Central. A temporary agreement has, however, been made under which trains will continue to run through from Saybrook and Hartford to Springfield until a permanent arrangement can be concluded.

White River.

At a recent meeting of the directors it was reported that only $1,900 out of the $80,000 subscriptions needed to secure the construction of this road remained to be raised. The line is to be about 12 miles long, and is to connect Rochester, Vt., with the Vermont Central at Bethel. The directors undertook to raise the $1,900 in a few days.

Davenport & Northwestern.

An election is to be held in Davenport, Ia., to decide the question of a city subscription in aid of the extension of the road from its present terminus at East Davenport into the city.

Pennsylvania.

The longest passenger train on record passed over this road Aug. 3. It carried a number of military organizations on their way to the Centennial encampment. It left Pittsburgh in the morning and was continually added to until it reached Harrisburg. It left that place with 110 cars, running in 11 sections, and reached Philadelphia without detention. The number of passengers was about 5,500.

A large reduction, about 10 per cent., has been made in the working force of the New York Division. It is said that the causes for this were the lighter freight movement and the fact that the Centennial travel between New York and Philadelphia has been less than was expected.

Forty-five out of the 65 third-class Centennial excursion cars are being altered to peach cars. These cars are box cars, provided with windows (closed by curtains only), with plain board seats, and were provided for the third-class Centennial trains between New York and Philadelphia. They were used but a short time, however, other cars being substituted for them.

Flint & Pere Marquette.

C. B. Tucker and O. Prescott, trustees, give notice that they will receive, at New Bedford, Mass., until Aug. 21, proposals for the sale to them of $25,000 of the land-grant bonds of the company. The bonds must be within the numbers 1,201 to 1,800. They are wanted for cancellation under the terms of the mortgage.

Erie Southern.

The Erie (Pa.) *Dispatch* says: "At a recent meeting of the directors of the Erie Southern Railroad, Mayor Hammond stated that he was in receipt of a proposition from Titusville parties to build the road from Titusville to Cambridge, and there connect with the proposed Erie Southern. By thus uniting the two roads in operation, they offered inducements which the road at present contemplated could not offer. The proposition was favorably received and was referred to Messrs. Hammond, Cook and Carroll.

Galveston, Houston & Henderson.

The change of gauge of the 49 miles of this road from 5 ft. 6 in. to 4 ft. 8½ in. was made July 29, in accordance with previous arrangements, the Houston & Texas Central changing at the same time. The change was made successfully, no accident or trouble occurring. This completes the extension of the standard gauge to Galveston.

Lehigh Valley.

The engines of this company and its train gangs now run through to Buffalo over the Erie on its coal and freight trains. The distance from Waverly to Buffalo is divided into two runs, one from Waverly to Hornellsville, 76 miles, the other, coinciding with the Erie's Buffalo Division, from Hornellsville to Buffalo, 91 miles. The company will build a round-house of its own at Hornellsville and probably a small repair shop.

The coal depot which the company is building at Newark, N. J., is nearly ready for use, the trestles and storage bins being almost finished. They will have a storage capacity of 20,000 tons and facilities for loading 36 wagons at once.

Houston & Texas Central.

The change of gauge of the 120 miles between Houston, Tex., and Hearne, was successfully made July 29. The entire main line is now of 4 ft. 8½ in. gauge, leaving the Western Division, from Hempstead to Austin, still 5 ft. 6 in. gauge.

Monadnock.

Arrangements for the extension of this road from Peterboro, N. H., to the Concord & Claremont at Hillsboro Bridge, have progressed so far that the preliminary surveys have been ordered to be made at once.

Texas & Pacific.

The bill to extend the time for the completion of the Transcontinental Division from Sherman to Texarkana and the main line to Fort Worth, and to avoid the forfeiture of the land grant, has passed the Texas Senate by a vote of 18 to 12, in the face of a very bitter opposition.

Three mortgages upon the road have been put upon record in Texas. One is to secure an issue of $8,908,000 in 7 per cent currency bonds; one to secure 6 per cent. gold bonds not to exceed $8,000 per mile, and a third, or consolidated mortgage, to secure 6 per cent. gold bonds not to exceed $25,000 per mile. The two last are made to Matthew Baird and S. M. Felton, trustees.

Intercolonial.

Mr. Schreiber, Government Engineer, has been making an examination of the Riviere du Loup Division of the Grand Trunk, and it is said that negotiations are in progress for its purchase by the Canadian Government. It extends from Chaudiere Junction, eight miles from Quebec on the Quebec Branch, east to Riviere du Loup, 126 miles, and the trains of the Intercolonial use it to reach Quebec. It has had an extremely light traffic heretofore, and the Grand Trunk would probably be very willing to sell it. It is said to be in very poor condition.

Columbia & Port Deposit.

Work has been resumed on the lower end of this road and iron is being delivered at Port Deposit, Md. Tracklaying is also in progress on the northern end. The bridge over Octorara Creek, near Rowlandsville, is being erected and will soon be ready for use.

Sunbury & Lewistown.

The lease of this road to the Pennsylvania Railroad has been finally concluded, and trains began to run regularly over it July 29, for the first time since Jan. 1, 1875. All coal trains received at Sunbury for the main line of the Pennsylvania will hereafter go over this road.

Dividends.

Dividends have been declared by the following companies:

Cleveland & Pittsburgh, 1¾ per cent., quarterly, on the new guaranteed stock, payable Sept. 1.

Pullman Palace Car Co., 2 per cent., quarterly, payable Aug. 15.

Hannibal & St. Joseph.

In accordance with the provisions of the trust deed, the trustees of the land mortgage of this company will receive proposals for the sale to them of $50,000 of the bonds issued under that mortgage. Proposals may be sent to the office of Charles Merriam, Agent for the trustees, Sears Building, Boston, or to William H. Swift, at the office of Ward, Campbell & Co., No. 56 Wall street, New York, until Aug. 18.

The Train Robbery in Missouri.

A St. Louis dispatch of Aug. 9 says: "The *Times* of this morning has a special dispatch from Sedalia, which says that Hobbs Kerry, the train robber, was brought there from Boonville to-day, and upon the positive assurance of entire immunity made a confession regarding the robbery of the train near Otterville. He said that those engaged in the affair were Clel Miller, Frank and Jesse James, Cole and Bud Younger, Charles Pitts, William Chadwell and himself. He said Clel Miller received the jewelry that was stolen, but the dispatch does not say how the rest of the money or the property was divided.

"Kerry offered to guide the officers to the place, 18 miles south of Sedalia, where they buried the papers taken from the safes, and at last accounts he and the officers had started on the search. He also confessed to other robberies committed by this party, and said that Clel Miller assisted in the robbery of the Huntington (West Virginia) Bank and the El Paso stage coach, and was present at the Gads Hill (Mo.) train robbery.

"The officers have information that the Younger brothers were in Clay county Monday, and that Chadwell and Pitts were arrested in Southern Kansas as before reported. They do not expect to capture the Younger and James brothers alive."

Providence & Boston.

The latest of the many narrow-gauge projects now being talked of in Massachusetts is for a line from Providence to Boston, 45 miles, to compete directly with the Boston & Providence road. Surveys are, it is said, to be made at once.

Auction Sales of Railroad Securities.

In New York, Aug. 9, at auction, New Jersey & New York mortgage bonds brought 10; Hackensack & New York Extension first-mortgage bonds, 10; St. Louis, Kansas City & Northern stock, 6½; St. Louis & Iron Mountain, first-mortgage Arkansas Branch, 75⅛; Burlington, Cedar Rapids & Minnesota, first-mortgage, Pacific Division, 10.

Erie.

The repair shops at Jersey City and other points have been put on eight hours' time. Some 50 men have also been discharged at Jersey City, and the working force all along the line has been cut down, some 1,500 men being discharged in all.

The employes were paid off for May last week, leaving two months' pay still due.

Cincinnati Southern.

Track is now laid from the Ohio River opposite Cincinnati southward 25 miles. Tracklaying is also going on on the section between Lexington and the Kentucky River, and from Danville, Ky., southward.

The masonry piers for the Kentucky River bridge are now nearly completed, and the erection of the iron piers and the superstructure will soon be begun.

Illinois Central.

The Land Department reports for July sales of 320 acres for $2,708. Cash collections on land contracts were $6,843 92.

The Traffic Department reports earnings as follows:

	1876.	1875.	Decrease.	P. c.
In Illinois, 707 miles..	$376,932 85	$526,042.44	$149,109.59	28.3
In Iowa, 402 miles....	105,069.92	189,856.45	84,786.53	44.6
Total, 1,109 miles.	$482,002.77	$715,898.89	$233,896.12	32.7

In explanation of this great decrease the company's monthly report says: "On the 4th and 5th ultimo a storm of exceptional violence broke upon the line in Northern Illinois and Eastern Iowa. Five inches of rain fell in ten hours, many culverts were washed away and other damage was done, suspending the passage of trains. Notwithstanding the most vigorous efforts of the company's officers, business was not fully resumed for a fortnight. Hence a decline in earnings."

Burlington & Missouri River in Nebraska.

The Judiciary Committee of the House of Representatives has agreed to report a bill declaring this company's road entitled to all the privileges conferred upon the branches of the Pacific railroads by the acts of 1862 and 1864, and requiring the Union Pacific Company to pro-rate upon all passengers and freight going over this road to points on the Union or Central Pacific west of Cheyenne and to exchange business generally upon fair and equal terms.

Atlantic & Great Western.

A circular issued by the Trustees for the Reorganization in London and dated July 24 says that "the negotiations recently opened with the holders of five-sixths of the Ohio mortgage bonds for the renewal of that mortgage for a period of three years have been successful, and that no disquietude need exist among the bondholders on this head."

Miami Valley.

The board has awarded the contract for the construction of this road to John B. Benedict, of Cincinnati, who is to begin work by Sept. 1. The line as finally located begins at Court street and Broadway, in Cincinnati, runs up Deer Creek Valley, through West Walnut Hills, Avondale and Norwood, east of Pleasant Ridge, then follows the ridge to Mason, thence through Lebanon and Waynesville to Xenia. The distance from Cincinnati to Xenia is 55 miles. The road is to be of 3-ft. gauge.

Saddle River.

It is now proposed to build so much of this projected road as extends from Monsey, N. Y., southward through the Saddle River Valley to the New Jersey Midland at Rochelle Park, N. J., about 18 miles. A contracting firm has offered to build the line if $10,000 per mile can be raised, and it is said that arrangements can be made with the Midland to work the new line. The proposed line is parallel to and about half way between the Erie and the New Jersey & New York.

New York Central & Hudson River.

An associated press dispatch from Albany, N. Y., announced that a mortgage for $32,000,000 on this road had been put on record in the County Clerk's office. Officers of the company state that this is altogether a mistake. The last mortgage is that made for $40,000,000 ($30,000,000 7 per cent. currency and £2,000,000 6 per cent. sterling bonds), which was executed and recorded in 1873.

Philadelphia & Reading.

In accordance with the terms of the mortgage 224 bonds of the 6 per cent. improvement mortgage issue have been drawn for redemption, and will be paid off Oct. 1, either at the company's office in Philadelphia, or at the office of McCalmont Brothers & Co., London. Interest will cease from Oct. 1. The numbers of the bonds drawn are: 2, 57, 86, 125, 131, 213, 365, 379, 509, 536, 552, 576, 607, 619, 635, 638, 639, 641, 693, 743, 755, 900, 903, 904, 906, 966, 970, 982, 1020, 1127, 1158, 1199, 1202, 1281, 1347, 1422, 1430, 1478, 1485, 1600, 1642, 1660, 1662, 1668, 1822, 2030, 2084, 2093, 2140, 2151, 2164, 2309, 2375, 2434, 2467, 2486, 2504, 2562, 2569, 2579, 2630, 2695, 2867, 2940, 2977, 2998, 3004, 3132, 3173, 3232, 3272, 3291, 3332, 3353, 3454, 3497, 3603, 3700, 3709, 3836, 3843, 3849, 3888, 3923, 3924, 4052, 4124, 4209, 4286, 4355, 4407, 4417, 4418, 4426, 4432, 4519, 4534, 4555, 4677, 4761, 4796, 4820, 4957, 4992, 5041, 5118, 5196, 5200, 5260, 5265, 5327, 5501, 5548, 5555, 5579, 5590, 5603, 5657, 5744, 5841, 5874, 5901, 5906, 5981, 6049, 6074, 6123, 6269, 6274, 6280, 6288, 6381, 6432, 6471, 6482, 6565, 6644, 6667, 6697, 6776, 6795, 6798, 6831, 6915, 6959, 6966, 6987, 7021, 7118, 7208, 7303, 7307, 7447, 7448, 7518, 7573, 7582, 7612, 7675, 7683, 7790, 7798, 7807, 7868, 7964, 7999, 8080, 8091, 8113, 8124, 8144, 8162, 8206, 8222, 8224, 8257, 8298, 8310, 8314, 8341, 8358, 8379, 8433, 8453, 8469, 8500, 8518, 8536, 8644, 8768, 8810, 8844, 8869, 8879, 8890, 8963, 9018, 9061, 9107, 9149, 9208, 9283, 9324, 9334, 9393, 9405, 9431, 9438, 9496, 9499, 9502, 9511, 9535, 9550, 9559, 9622, 9623, 9753, 9776, 9837, 9866, 9945, 9977, 9980.

Kansas City, Memphis & Mobile.

In the suit brought by the Attorney General of Missouri the Circuit Court has granted an injunction to restrain the County Court of Greene County from delivering to this company $110,000 in bonds, being the balance of the subscription voted in aid of the road.

Wyandotte, Kansas City & Northwestern.

Track is now laid to Lexington, Mo., 44 miles eastward from Kansas City, the western terminus. Passenger trains began to run through to Lexington, Aug. 4. The road is of 3 ft. gauge and has been built chiefly with local and municipal subscriptions.

Chicago, Dubuque & Minnesota.

The La Crosse (Wis.) *Republican* of Aug. 5, says: "Messrs. Johnson and Adams, of the Chicago, Dubuque & Minnesota Railroad, held a consultation with Mayor Hogan and Alderman Michel, in the International Hotel, Wednesday, in regard to the entry of their road into the city. The road is exceedingly anxious to run directly into the city, and desires to come in about Second street to the heart of the town, and assert that they want so to do, simply to gain the business of La Crosse for their section of the country. The plans are not prearranged, but will be in a short time, when the matter will be put in a more definite shape. In case the track is laid on this side of the river the company will erect first-class depots and other buildings which will tend greatly to improve the city, and add much to the tangible value of our real estate.

"Messrs. Adams and Johnson left La Crosse this noon, but will return in a day or so, when something definite will be arrived at."

Central Pacific.

On the new loop line from Oakland, Cal., by Martinez and Antioch to Banta, track is laid to Shell Mound, three miles from Oakland Point, and on the Berkeley Branch, which diverges at that point, to the State University grounds at Berkeley, three miles further. A force of 400 men is at work between West Berkeley and San Pablo, and it is said that the company intends to have the line completed by the close of the year, or soon after.

Mobile & Ohio.

A largely attended meeting of first-mortgage bondholders was held in Mobile, Ala., Aug. 3, to consider the plan of reorganization proposed by the company. There was a long discussion, which ended in the appointment of a committee to examine into the plan and the conditions of the road and report hereafter.

Delaware, Lackawanna & Western.

The company has begun running excursion trains from points on the Morris & Essex Division to the Centennial, the trains being transferred to the Pennsylvania at East Newark. The first train ran this week, starting from Dover, N. J., and they will be continued if they prove profitable.

All trains have been withdrawn from the section of the main line between Washington, N. J., the Junction with the Morris & Essex Division, and Hampton Junction on the Central of New Jersey, except a way freight. The shops at Hampton Junction have been closed and the tools sent to Scranton. The distance from Washington to Hampton Junction is 12 miles, and this action withdraws the connection heretofore made with the Central.

Philadelphia, Newtown & New York.

This road was to have been sold at sheriff's sale in Philadelphia, Aug. 7, but the sale was postponed. The bondholders have taken action in the case, and will hold a meeting at Newtown, Pa., Aug. 12, to consider what is best to be done.

The road is now in operation from Erie avenue, Philadelphia, to Fox Chase, six miles, and it is graded and bridged to Newtown, 10½ miles further.

Bellaire & Southwestern.

The contract for the construction of this road from Armstrong's Mills, on the Central Ohio Division of the Baltimore & Ohio, to St. Clairsville, 6¼ miles, has been let to R. D. Walsh, who has begun work. The contractor is to do the grading and bridging and to lay the track for $9,000, the company supplying ties, rails and an iron train when needed. It is to be of 3 ft. gauge, with rails 30 pounds to the yard.

Iron Mountain, Chester & Eastern.

The new Receiver, Mr. C. B. Cole, will proceed as fast as possible to put the line in good repair. The case of Dr. T. M. Sams, who claims to have been appointed Receiver by the Illinois Circuit Court, has been set over to the November term. Mr. Cole's appointment is from the United States Circuit Court.

Central, of Iowa.

Receiver J. B. Grinnell reports to the Court as follows for the six months ending June 30: "A. Russell, Superintendent Passenger Department, shows that there were 23,335 passengers carried above the corresponding months in 1875, and an increase of the net earnings for the same period of $18,276.

"J. C. Manley, Superintendent of Freight Department, reports an increase of tonnage over 1875 of 62,000,000 pounds, or 1,529 cars. The net increase from freight earnings is $7,475.51. The compliance of the east-and-west railroads with rates made by the State law has lowered the Central charges, of necessity,

about 25 per cent., and impaired our earnings, based on former rates, in about the same ratio. In addition, the extension of the Chicago, Rock Island & Pacific from the east to Oskaloosa has materially reduced our business at that point. The failure of the grain crop of 1875 caused a falling off in our grain transportation of 1,300 cars.

"The machinery department shows that trains ran 294,773 miles, and an increase of 77,907 above 1875, and, after deducting increased cost of fuel for extra trains, shows a net saving of $3,342.82, or 26 per cent. on an increased mileage. It is to be said that freedom from snow and a careful movement of trains on a smoother track has contributed much to this favorable showing, not less than a remarkable exemption from casualties. F. B. Woodruff, Master Mechanic, is justly proud of this report.

"T. L. Seevers, Superintendent of Car Repairs, reports an expenditure in his department of $5,000 in excess of last year, several cars having been rebuilt and fitted with modern improvements and reclining chairs, making passenger accommodations first class, and promising an increased revenue, besides giving good satisfaction to the public.

"C. C. Gilman, Chief Engineer, reports the road-bed in good condition, comparatively, and has placed in track 46,556 new ties, costing 43½ cents each, being 9,000 more than used in same period in 1875, and costing about one cent each less. His total expenditure has been $111,855.50; about $30,000 above 1875, in part for three new stations and side tracks; three extra ditching and ballast trains, and 21 miles of new legal board and wire fence. This new fence was a necessity, and many miles in addition, to comply with right of way contracts and the safety of trains on curves and grades imperiled by stock at large, and in order to lessen the destruction of animals.

"I required locomotive engineers to report to me directly in regard to all stock maimed or killed, and the claims for damages having been reduced 100 per cent., I give the train men great credit for vigilance and caution in this regard.

"The pay-roll for June, excepting the extra track force, shows on an increase of business of 23 per cent. a reduction of 5 per cent.

"No litigation has grown out of the past six months' business, save two or three suits on account of injuries occasioned by a broken rail last February, which I have held as an unavoidable casualty. That no other serious accident has happened to employes or patrons may be ascribed to A. Russell, General Superintendent, and O. A. Jones, Train Dispatcher.

"T. J. Fletcher, who has efficiently served as Auditor and Cashier, reports the Receiver's accounts returned to your court by P. L. Lomax, Esq., Master in Chancery, as correct, with details of receipts and disbursements monthly.

"In conclusion, I regret to report a partial failure of the wheat crop, which will materially reduce our revenue, and only the strictest economy in details and the best of fortune will bring an income from this property to the owners; and it is a pleasure to report that the employes generally, and all the heads of departments, are efficient and faithful."

Northern Central.

The Baltimore *Gazette* thus describes the new elevator now being built at Canton, near Baltimore: "The pier upon which the elevator is being erected is 500 feet long, and extends into the water to the port warden's line. It was built for the company by Sanford & Co., of New York, and is one of the most substantial works of its character in the harbor. The elevator, which is now almost completely under shelter, is 145×84 feet, and will have a capacity for storing 750,000 bushels of grain. There are 140 bins, varying in size from 8×9 feet upward, and each has an average depth of 62 feet, and being built of heavy timbers. There are two rows of shutes facing the water upon each side, the upper row carrying the grain direct from the supply pipe after weighing, and the lower from the stowage bins. These are to supply vessels with the grain. Under the elevator are four tracks, upon which the loaded cars are run, and are so arranged as to have a hopper for receiving the grain placed in such a position as that the contents of two cars can be received simultaneously, the unloading to be done with steam shovels. After being placed in the hoppers the grain is carried to the top of the elevator, first to the blowing department, where, if necessary, it is cleaned; thence to the scales, where it is weighed, and then either shipped direct to vessels, *via* the shutes, or into the stowage bin. There is also a traverse belt carrying the grain the full length of the building, which obviates material labor in transporting grain from one bin to another. As some of the shippers require their grain bagged, two capacious bagging rooms will be fitted up in each wing of the building. The whole exterior of the building will be covered with slate, and it is anticipated will be ready for occupancy about the first of October. Two large horizontal locomotive engines for the movement of the elevator machinery are being placed in the boiler room, which is situated in under the pier immediately in the rear of the left wing of the elevator and well encased in a house of solid brick and stone masonry, the dimensions of which are 64×19 feet. In the rear of the elevator have been erected two covered sheds, 110×25 feet, for the reception and handling of freight in transit. An additional pier and lock has also been built adjoining the elevator, at which the barge recently manufactured by the company will land with freight from the city station, thus avoiding the usual street truckage, which expense has hitherto amounted to no inconsiderable sum of money."

Chicago & Lake Huron.

A considerable force is now at work between Flint, Mich., and Lansing, on the grading of the line which is to connect the two sections of this road.

Baltimore, Philadelphia & New York.

The injunction against the sale of this unfinished road has been dissolved, and the property was to be sold this week by the sheriff. It was expected that the contractor, at whose suit the sale is made, would buy it in.

Anderson, Lebanon & St. Louis.

The work of tracklaying and ballasting has been temporarily suspended, in consequence of a difference between the company and the contractors.

Trinidad, New Mexico & San Juan.

A company by this name has been organized to build a railroad from Trinidad, Col., southward to Taos, New Mexico, with a branch to the San Juan mining region in Colorado. It is said to be in the interest of the Kansas Pacific, and in opposition to that of the Denver & Rio Grande.

Boston & Albany.

The question of beginning suit against the officers of this company as authorized by the Legislature last winter, having been submitted by the Governor and Council of Massachusetts to Hon. E. R. Hoar for his opinion, he, after careful study of the matter, replies as follows:

"The result of my investigation is, that I am unable to find in the evidence submitted to me sufficient proof that 'any moneys or other property due or belonging to the Boston & Albany Railroad Company' are 'in the hands of any officer, director, agent or employe thereof, or any other person,' for the recovery of which any proceedings in law or equity would be made available; nor can I advise you that any proceedings 'on behalf of the Commonwealth for the protection of its interest as a stockholder of the Boston & Albany Railroad Company' would be likely to lead to the recovery of any such property.

"The acts complained of are not, in my opinion, such as create a right of pecuniary compensation in the aggrieved party, and the remedy for them is not to be found in the courts."

This probably ends the matter, unless it is brought up again at the next session of the Legislature.

Pine River Valley & Stevens Point.

This is the name of the road whose completion was recently noted under the head of Chicago & Tomah. It extends from Lone Rock, Wis., on the Prairie du Chien Division of the Chicago, Milwaukee & St. Paul, northwest to Richland Center, the county seat of Richland County. The stations, with distances from Lone Rock, are: Harter Junction, 2 miles; Richland City, 5; Twin Bluffs, 10; Richland Center, 16. It is of 3 ft. gauge, and is laid with wooden rails. These rails are of maple, 3½ by 5 in., and are secured to the cross-ties by gains and wedges. Strap iron is laid on the curves where extra wear may be expected. The equipment consists of an 11-ton engine, one box and nine flat cars; a passenger car is to be added soon. The road cost about $70,000, or $4,375 per mile, the money being raised by stock subscriptions and a town subscription of $19,000. The contractors were James Brothers & Co., of Richland Center, and the company still owes them about $20,000.

San Francisco & North Pacific.

The new branch to Guerneville is now open for traffic, and trains run regularly over it. It leaves the main line at Fulton, Cal., 27 miles north of the southern terminus at Donahue, and the stations upon it, with distances from Fulton, are: Korbel's, 3 miles; Laguna, 10; Guerneville, 16.

Waynesburg & Washington.

At a recent meeting the directors authorized President Richey to expend $10,000 in rails, and to begin laying track on the road.

East River Bridge.

The United States Circuit Court has denied an application for an injunction to restrain the trustees from proceeding further with the construction of the bridge between New York and Brooklyn. The court held that the approval of the bridge by authority of Congress was proof that the bridge would not be an obstruction to navigation.

Vidalia & Lake Concordia.

The grading of this road is nearly finished, the depot buildings are being put up, and the contractors will soon be ready to begin tracklaying. It is to extend from the Mississippi at Vidalia, in Concordia Parish, La., west about five miles to Lake Concordia.

Anderson & Pickens.

There is talk of building a narrow-gauge road from Anderson, S. C., north by west to Pickens, about 32 miles, crossing the Atlanta & Richmond Air Line at Easley's, seven miles from Pickens and 25 from Anderson. It is said that it can be very cheaply built.

South Pacific Coast.

Two large and heavy draw-bridges are being built between Dumbarton Point, Cal., and Alviso, and tracklaying is delayed until their completion. Three miles of grading are still to be done to reach Alviso, and this section is all through a marsh and will require a great deal of filling.

New York, Providence & Boston.

This company has just received 1,500 tons of steel rails from Troy, N. Y., which are to be used in extending the second track. Two new engines have been added to the equipment.

Willimantic & Southbridge.

It is proposed to build a narrow-gauge road from Willimantic, Conn., northward through Mansfield, Chaplin, Ashford, Eastford and Woodstock to Southbridge, Mass. The distance is about 30 miles through a row of farming towns not now provided with railroad facilities, though none of them are more than 10 or 12 miles from the New London Northern on one side and the Norwich & Worcester on the other.

Colchester.

The town of Colchester, Conn., has finally voted to take $25,000 stock in this road, which is to be about five miles long, and to connect the town with the Boston & New York Air Line. This vote will probably secure the construction of the road.

New Bedford & Boston.

A considerable amount has been subscribed to the stock of this projected road, and a company will be organized soon. It is to run from New Bedford, Mass., northward through Middleboro to Boston, about 50 miles. It would pass through a section already very well provided with railroads.

South Carolina.

This company is giving all its conductors in turn leave of absence to visit the Centennial, and furnishes them with free passes to Philadelphia and return.

Burlington & Southwestern.

Tracklaying has been begun on the gap of 20 miles between Unionville, Mo., the southwestern terminus of the Iowa Division, and Ashton, the northern terminus of the Missouri Division. The filling of this gap will complete a new line from Burlington to Kansas City and St. Joseph by the Hannibal & St. Joseph road.

New Brunswick.

Surveys are being made for the extension of this road to Grand Falls, N. B., and the work will probably be done next year. Grand Falls is on the St. John River, about 20 miles north of the present terminus.

Pittsburgh, Wheeling & Kentucky.

The Pennsylvania Company has declined an offer made to transfer this road to it as it now stands, on condition of its completion. There is some doubt as to the legality of such a transfer. Nothing further will be done until after the next session of the West Virginia Legislature, which will be asked to legalize the proposed arrangement.

Milford & Woonsocket.

This company has made an issue of $19,000 new 7 per cent. mortgage bonds. By the last report (Sept. 30, 1875) the company had no bonded debt, but a floating debt of $26,000. The road is four miles long, from Milford, Mass., to Bellingham, and is leased to the Providence & Worcester.

Southbridge & West Brookfield.

It is said that $340,000 out of the $400,000 necessary to build this road has been promised and that a company will soon be organized and work begun. The line is to be from Southbridge, Mass., northwest to the Boston & Albany at West Brookfield, about 12 miles. It will be part of the proposed direct line from Providence, R. I., to Springfield, Mass.

New Haven & Northampton.

Some time since the Connecticut Superior Court issued a *mandamus* ordering this company to stop its trains at the depot in Plantsville, concerning which there has been so much trouble. As the Supreme Court had already passed upon the question, there was no appeal within the State, but the company appealed to the Supreme Court of the United States and disregarded the writ of *mandamus*, claiming that the appeal superseded it. The Superior Court, however, has taken a different view, and, in Hartford Aug. 2, made an order directing the company to obey the writ, and to stop trains at Plantsville within 20 days. Failing to do this, all directors of the company who can be found within the jurisdiction of the Court will be arrested and imprisoned in the Hartford County jail.

Laurens.

The trustees appointed to distribute the proceeds of the sale of this road recently made a report to the United States District Court, which was confirmed. In answer to a question submitted by the trustees, the Court ordered that the former order directing the bonds to be canceled be rescinded, and that the trustees be directed, instead of canceling the bonds and coupons, to endorse upon them the amount actually paid to the holders.

It is understood that this order does not affect the position of the holders of the old bonds so far as the present owners of the road are concerned, but it leaves them free to prosecute their claim against the State of South Carolina for interest guaranteed.

Scioto Valley.

Several lines have been surveyed for the coal branch, and it is said that the one which will be adopted leaves the main line at Ashville, O., 21 miles south of Columbus and runs thence west about 10 miles to Haydenville. The best grades found were on this line.

Federal Creek Valley.

This line is now partly graded and arrangements are being made for the iron. The money is all to be raised by stock subscriptions. The road, which is to open a coal district, is to extend from the Marietta & Cincinnati near Big Run, O., through the Federal Creek and Sharp's Fork valleys to Moxahala, 30 miles. The part now graded is from Big Run to Stewart, 16 miles.

New Castle & Franklin.

This company has just completed the grading and bought the rails for a branch two miles long, intended to serve some coal mines in Mercer County, Pa.

Lewisburg, Center & Spruce Creek.

The stockholders of this company have ratified a new lease of the road to the Pennsylvania Railroad Company for 99 years. The road is now completed and in operation from Montandon, Pa., on the Philadelphia & Erie west by south 19 miles to Laurelton. It is to be extended from Laurelton about 23 miles to Spring Mills, in Center County, where construction will stop for the present. The terminus which the company expects to reach hereafter is Tyrone.

New Orleans, St. Louis & Chicago.

In the foreclosure suit now pending before the United States Circuit Court, Mr. F. A. Woolley has been appointed Special Master to receive proofs of debts and claims due under the decree. Proofs can be made at No. 31 Nassau street, New York, from Aug. 18 to Aug. 22; at the office of the Clerk of the United States Circuit Court, Jackson, Miss., Sept. 11, and at the office of the Clerk of the United States Circuit Court in New Orleans from Sept. 14 to Sept. 19. The examination of the proofs, preparatory to making up the report to be submitted to the Court, will be made at the last-named place (in New Orleans) between Oct. 2 and Oct. 7, by the Master.

Central, of New Jersey.

After holding several conferences, through a committee, with Superintendent Ricker, the enginemen and firemen have finally decided to continue work at the reduced rate of wages. It is understood that the reduction applies to all officers and employes without distinction. There has also been trouble with the large bodies of workmen employed on the coal docks at Elizabethport and Port Johnston, but it is believed that they also will continue work at the reduced rates.

Toledo, Peoria & Warsaw.

Receiver Hopkins reports for June and July as follows:

Balance on hand June 1	$942 93
Freight accounts	212,806 79
Passenger "	73,597 17
Other "	34,634 93
Total	$321,981 82
Disbursements on all accounts	321,097 00
Balance, Aug. 1	$884 82

The receipts were $58.11 less than the disbursements.

St. Joseph & Pacific.

This company has filed its articles of incorporation with the Secretary of State of Kansas. The company is organized by the bondholders who bought the St. Joseph & Denver City road at foreclosure sale, and is to be successor to that company.

Missouri, Iowa & Nebraska.

The engine house at Centerville, Ia., was struck by lightning and set on fire on the night of July 28. It was entirely destroyed and an engine badly damaged.

Burlington, Keosauqua & Western.

The board of directors has ordered a preliminary survey to be made and estimates prepared for the line from Burlington, Ia., west to Keosauqua, which is about 45 miles long.

Wisconsin Central.

Work is to be resumed on the gap in the main line between Worcester, Wis., and Penokee. The company has been calling for 500 men to work there.

Painesville & Southern.

A company by this name has filed articles of incorporation in Ohio and purposes building a narrow-gauge road from Fairport, O., through Painesville, Chardon and Burton to Newton Falls in Trumbull County. It is said that this is intended to be the northern end of the Lake Erie, Alliance & Wheeling road, which was to connect with the Painesville and Youngstown, but has now resolved to build its own outlet to navigation.

Flint & Pere Marquette.

The Land Department reports for the first half of 1876 sales of 3,343 acres for $32,508.49; cash collections on land contracts were $44,574.63. Earnings and expenses for the same period are reported as follows:

	1876.	1875.	Inc. or Dec.	P.c.
Gross earnings	$480,117 74	$517,670 49	Dec.. $37,553 02	7.3
Working expenses	296,036 72	368,902 42	Dec.. 72,865 70	19.8
Net earnings	$184,080 75	$148,768 07	Inc.. $35,312 68	23.7
Earnings per mile	$1,709	$1,842	Dec.. $133	7.3
Per cent. of exps	61.66	71.26	Dec.. 9.60	13.5

During the half-year $5,625.32 were expended and $6,000 received on construction account. From Oct. 1, 1875 to July 19, 1876, the bills payable were reduced $478,370.90, of which reduction $273,000 was from sale of new bonds. The holders of about four-fifths of the consolidated bonds have agreed to fund their coupons as proposed by the company.

Little Rock & Hot Springs.

A conditional contract for the construction of this road has been let to W. P. Hanchett. If the conditions are carried out, work will be begun Oct. 1, 1876, and finished by Oct. 1, 1877. The line is to run from Little Rock, Ark., southwest to Hot Springs, about 60 miles. The two places are already connected by the St. Louis, Iron Mountain & Southern and the Hot Springs Branch.

ANNUAL REPORTS.

Louisville, Cincinnati & Lexington.

A statement of the earnings, expenses and net profits for the year ending June 30 is submitted by Mr. Wm. Mahl, Aditor, with the following remarks: "The earnings and expenses for the four years stated embrace those of the Louisville, Cincinnati & Lexington (174.90 miles), Shelby (18.60 miles), and Big Sandy railways (23.50 miles), total 227 miles. For the years 1873 and 1874 they include the earnings and expenses of the Louisville Railway Transfer (4.13 miles.) Prior to 1873 the company operated only the line to Lexington and Cincinnati (114.90 miles), and the earnings and expenses are omitted for comparison. The expenses for 1873 do not include the sum of $54,347.50 expended in that year in adjusting the suits for damages arising from the falling of Tenmile bridge in the spring of 1872. The increase in the rentals and deficits for 1874 is occasioned by the charges of $17,786.50 for tolls on cars over the Newport & Cincinnati bridge (which item has in the other years been charged against the earnings), and the sum of $14,631.19 deficit in the guaranteed traffic to the Newport & Cincinnati bridge. The taxes include State and city taxes."

The statement is as follows:

	1875-76.	1874-75.	1873-74.	1872-73.
Gross earnings	$1,125,249 26	$1,132,560 64	$1,183,071 35	$1,212,027 14
Operating expenses, ordinary	705,023 67	804,458 80	888,034 90	928,367 14
Renewal of ties and rails	98,351 76	93,972 26	36,100 49	48,207 82
Total operating expenses	$803,375 43	$898,431 06	$924,135 39	$976,574 96
Net transportation earnings	$321,872 83	$234,129 58	$268,935 96	$235,452 18
Construction and improvement	9,705 32	7,052 45	.....	.....
Taxes, rentals and deficits	76,702 95	89,126 22	118,137 74	81,781 67
Net profits	235,465 56	137,950 91	150,798 22	153,670 51

From this we derive the following general averages:

	1875-76.	1874-75.	1873-74.	1872-73.
Gross earnings per mile	$4,957	$4,989	$5,122	$5,247
Net " " "	1,418	1,031	1,164	1 019
Net profits " "	1,037	608	653	665
Per cent. of expenses	71.31	79.33	78.11	80.57

A comparison of the last year, 1875-76, with the previous one, shows a decrease of $7,311.38, or 0.6 per cent., in gross earnings; a decrease of $95 055.63, or 10.6 per cent., in expenses; an increase of $87,743 25, or 37.5 per cent., in net earnings, and an increase of $97,514 65, or 70.7 per cent. in net profits. The last year, while showing the smallest gross earnings of the four, has also the smallest expenses, and shows the highest net earnings and the greatest net profit.

The road is in the hands of a Receiver in suits for foreclosure of mortgage, and a decree of foreclosure has been granted.

Kansas City, St. Joseph & Council Bluffs.

This company owns a line from Kansas City, Mo., following the general course of the Missouri River northwestward to Council Bluffs, Ia., 199.3 miles, with a branch from Amazonia, Mo., north to the Iowa line at Hopkins, 50.2 miles. It also works the St. Joseph & Topeka road, from St. Joseph, Mo., to Atchison, Kan., 25 miles, making 249.5 miles owned and 274 5 miles worked. The report covers the year ending Dec. 31.

The equipment consists of 31 engines, 34 passenger-train cars, 312 freight and 84 service cars.

The capital account is as follows:

Stock ($11,180 per mile)	$2,789,413 66
Bonds ($27,691 per mile)	6,909,000 00
Unpaid coupons	116,684 25
Funded coupons, notes, bills payable, etc	1,002,127 00
Accounts and balances due	365,259 23
Total ($44,419 per mile)	$11,082,484 14

The work done was as follows:

	1875.	1874.	Inc. or Dec.	P. c.
Train mileage	805,092	740,054	Inc. 65,008	8.8
Passengers carried	233,801	221,921	Inc. 11,880	5.4
Passenger mileage	12,948,031	12,541,738	Inc. 406,293	3.2
Tons freight carried	342,471	364,371	Dec. 21,900	6 0
Tonnage mileage	34,337,588	34,252,012	Inc. 85,576	0.2
Average rate per pass. per mile	4.084 cts.	4.213 cts.	Dec. 0.129 cts.	3.1
Average rate per ton per mile	2.170 "	2.385 "	Dec. 0.215 "	9.0

The General Manager's report says: "Last year, owing to the failure of the crops in Southern Missouri and Kansas, a large business was done between Iowa and Kansas City, in the first half of the year, in supplying that part of the country with corn; there was also at the same time an unusually large California travel. Owing to an almost entire failure of the crops along our line of road, the earnings of the latter half of the year fell off greatly from those of the same period the year before, and has caused a like falling off this spring. The prospect of good crops this coming season warrants me in saying that the net earnings of this year will fully equal those of 1875."

The earnings for the year were as follows:

	1876.	1875.	Inc. or Dec.	P. c.
Passengers	$528,841 40	$528,324 32	Inc.. $517 08	0.1
Freight	746,665 99	817,086 70	Dec.. 70,420 71	8.6
Other sources	87.198 95	90,662 24	Dec.. 3,463 29	3.8
Total	$1,362,706 34	$1,436,073 26	Dec..$73,366 92	5.1
Working exps	917,823 40	836,346 13	Inc.. 81,477 27	9.7
Taxes	60,005 79	60,000 00	Inc.. 5 79	....
Rentals, etc	33,007 67	44,818 41	Dec.. 11,810 74	26.4
Total	$1,010,836 86	$941,164 54	Inc..$69,672 32	7.4
Net earnings	$351,860 48	$494,908 72	Dec.$143,039 24	28.9
Gross earn. per mile	$4,902	$5,232	Dec.. $270	5.1
Net earn. per mile	1,292	1,803	Dec.. 521	28.9
Per cent. working expenses	67.35	58.24	Inc.. 9.11	15.6
Per cent. all expenses	74.18	65.54	Inc.. 8.64	13.2

The income account was as follows:

Net earnings	$351,860 48
Interest received	4,667 32
Total	$356,536 80
Interest and premium	458,580 70
Debit balance	$102,043 90

Payments on construction account amounting to $338,071.52 are also reported.

The report also says: "The gross earnings show a decrease from those of the previous year of $73,366. The operating expenses are increased, but the percentage of operating expenses should not blindly be accepted as a criterion of the management, for its amount is dependent, not only upon the gross earnings, but also upon the actual condition of the property and the mode of keeping accounts. Important improvements have been made upon the property during the past year.

"In view of the lack of co-operation by the holders of quite an amount of the lower securities, in the funding plan, dated March 25, 1874, and of the unexpected decrease in the earnings of the road, that plan has necessarily been abandoned, and no further action is deemed advisable at this time."

Missouri River, Fort Scott & Gulf.

This company owns a line from Kansas City, Mo., southward to Baxter Springs, Kan., 161 miles. Its report covers the year ending Dec. 31, 1875.

The debt at the close of the year was as follows:

Bonds outstanding ($43,149 per mile)	$6,947,000
Coupon notes, due Jan. 1, 1876	124,225
Bills payable	100,559
Unpaid coupons	1,238,450
Other accounts	38,893
Total ($52,479 per mile)	$8,449,127

Interest has been in default two years. The bonds all bear 10 per cent. interest.

The Land Department reports during the year sales of 27,316 acres for $210,564. The total sales up to the close of the year were 370,622 acres for $1,948,492; land still unsold, 372,312 acres. The total cash receipts up to the close of 1875 were $766,507; expenditures, $754,041; leaving a balance of $12,466.

The earnings and expenses were as follows:

	1875.	1874.	Inc. or Dec.	P. c.
Passengers	$187,208	$205,539	Dec. $18,331	8.9
Freight	443,718	447,490	Dec... 3,772	0.8
Other sources	46,917	40,371	Inc... 6,546	16.2
Total	$677,843	$693,400	Dec. $15,557	2.2
Working expenses	403,626	348,106	Inc .. 55,520	15 9
Taxes and insurance	70,602	49,500	Inc .. 21,102	4.2
Boston office	4,229	4,237	Dec.. 8	0.2
Construction	2,475	7,636	Dec.. 5,161	67.9
Total	$480,932	$409,479	Inc. $71,453	17.4
Net earnings	$196,911	$283,921	Dec. $87,010	30.6
Gross earn. per mile	4,210	4,307	Dec 97	2.2
Net " " "	1,223	1,763	Dec.. 540	30.6
Per cent working expenses	59.55	50.20	Inc... 9.35	18.6
Per cent. all expenses	70.95	59.05	Inc.. 11.90	20.2

The income account was as follows:

Net earnings	$196,911
Land Department receipts	51,070
County bond coupons paid	18,017
Total	$265,998
Land expenses	22,382
Net balance	$243,616

The report says:

"The gross earnings of the year show a decrease from those of the previous year of $15,556. This decrease is due to local causes.

"The present year (1876) opens with much encouragement, the earnings showing an increase of $50,000 for the first quarter, as compared with the corresponding period of last year, and the sales of land, commencing with December last, an increase for the four months ending March 31, 1876, of $177,398, as compared with the corresponding months of the previous years.

"Pursuant to our circular of Dec. 15, 1874, and in conformity with last year's practice, all the net revenues of the road, from Jan. 1, 1876, are to be placed in the hands of the trustees of the first mortgage bonds, and a dividend will be paid to the holders of said bonds on the first day of July next, which may reasonably be estimated as a half coupon, or 2½ per cent. on the first mortgage bonded indebtedness of the company."

Keokuk & Des Moines.

This company owns a line from Keokuk, Ia., northwest to Des Moines, 161 miles. It was formerly part of the Des Moines Valley road, and, when that road was sold under foreclosure, was bought by the first-mortgage bondholders, whose lien covered this section of the road, and who organized the present company. The present report is the second made by the new company, and covers the year ending March 31, 1876.

The equipment consists of 18 engines; 7 passenger, 2 sleeping, 1 smoking and 4 baggage, mail and express cars; 8 way, 205 box, 102 stock, 90 coal and 51 flat cars; 1 pay car, 2 boarding, 1 wrecking, 3 tool, 1 pile-driver, 1 saw-machine, 55 hand and 11 rail cars.

The capital account was as follows at the close of the year:

Preferred stock	$1,524,600 00
Common stock	2,400,000 00
Total stock ($24,376 per mile)	$3,924,600 00
First-mortgage 7 per cent. bonds	2,300,000 00
Funded interest 8 per cent. bonds	254,800 00
Total bonds ($15,868 per mile)	$2,554,800 00
Bills payable	168,057 84
Sundry accounts	54,567 02
Total ($41,627 per mile)	$6,702,024 86

The company holds $320,000 of its first-mortgage bonds.

Much work has been done during the year on the bridges, and they are reported in good condition, as is also the roadbed, except that some labor is needed on the ditches. There are now 78 5-6 miles of new fish-plate rails in the track, of which 26½ miles were laid during the year, besides 12 miles of repaired rails. There were used in repairs 55,130 new ties; many are still needed between Eddyville and Des Moines. Thirty miles of new fence were built and 6,079 feet new sidings laid. Two new tank-houses have been put up and several station buildings repaired. The new line of 11 miles from Buena Vista to Sand Prairie has been completed, giving much better grades than the old line, from which the rails have been taken up. The total expenditures for construction were $295,410.35.

The work done was as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Passenger train mileage	204,836	191,680	Inc .. 13,156	6.9
Freight train mileage	221,419	228,722	Dec.. 7,303	3.2
Total train mileage	426,255	420,402	Inc .. 5,853	1.4
Passengers carried	218,684	146,689	Inc .. 71,995	49.1
Passenger mileage	7,667,358	5,590,050	Inc ..2,077,308	37.2
Tons freight carried	242,359	222,346	Inc .. 20,013	9.0
Tonnage mileage	16,760,918	17,048,127	Dec.. 287,209	1.7
Average rate per passenger per mile	2.88 cts.	3.450 cts.	Dec..0.570 cts.	16.5
Average rate per ton per mile	2.83 cts.	3.007 cts.	Dec..0.177 cts.	5.9

The principal items of freight were: corn, 31,669 tons; other grain, 36,256 tons; lumber, 19,776,190 feet; lath and shingles, 3,993,500; coal, 29,149 tons; horses and cattle, 23,968 head; sheep, 10,827 head; hogs, 144,913 head. There was a decrease of 12,369 tons corn and 3,647 tons other grain, which was caused by short crops along the line. There was a gain in lumber, coal and general merchandise.

The earnings were as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Freight	$474,240 97	$512,759 14	Dec.. $38,518 17	7.5
Passengers	223,031 57	193,143 72	Inc .. 29,887 85	15.5
Other sources	44,066 55	51,478 74	Dec.. 7,412 19	14.4
Total	$741,339 09	$757,381 60	Dec.. $16,042 51	2.1
Expenses and taxes	514,501 01	474,513 51	Inc... 39,987 50	8.4
Net earnings	$226,838 08	$282,868 09	Dec.. $56,030 01	19.8
Gross earnings per mile	$4,605	$4,704	Dec.. $99	2.1
Net earnings per mile	1,409	1,757	Dec.. 348	19.8
Per cent. of exps	69.40	62.65	Inc... 6.75	10.8

The net earnings were sufficient to pay the interest on all outstanding bonds, and about 4½ per cent. on the preferred stock.

In July, 1875, the Executive Council of Iowa advanced the road to Class A under the railroad law of the State. This reduced the maximum rate of fare allowed to 3 cents per mile, with a reduction also in the freight rates allowed to be charged. This reduced the earnings and made the proportion of expenditures larger. The expenses were also increased by unusual repairs of track and bridges made necessary by freshets.

In the two years that the present company has owned the road, $777,933.80 have been expended for improvements. The funds have been provided from net earnings, from the sale of $132,000 bonds and the issue of bills payable, secured by pledge of $231,000 of the bonds still owned by the company.

The new line from Buena Vista to Sand Prairie has proved very successful, reducing the cost of transportation. It has been in use since November, 1875.

Zinc as an Anti-Incrustator.

Experiments have been made at the Darmstadt shops of the Main & Necker Railroad with zinc in boilers to prevent incrustation, suggested by a letter in *Engineering* by a Mr. Capelle, of Havre. The water used was very bad. From an article in *Die Eisenbahn* we translate and condense:

The first experiment was with a tubular boiler so made that the tubular portion attached to the fire-box end can be drawn out from the boiler barrel as a whole. This boiler was for a stationary engine. Into it were placed quantities of zinc, weighing from 13 to 22 lbs., in pieces as large as the fist once a month, and after three months' use the tubular part was drawn out. Before, after such service, the tubes had been covered with a thick incrustation. In this case the incrustation was almost too thin to be measured (at most only ¼ millimetre = 0.02 inch), except that where the feed-water entered there was a little space somewhat more thickly covered, though with quite loose particles.

Inside of the boiler barrel along the middle for its whole length there was a streak of incrustation about 1¼ in. wide, while in the lower part of the boiler there was nothing but a blue-black mud, easily removed by a broom and water. The boiler, however, had been in use four months before the use of zinc was begun. The whole amount of zinc used in the three months was 46½ lbs.

The second experiment was with a new boiler of similar construction but considerably larger. The zinc was introduced in similar quantities and at similar intervals as before until 72½ lbs. had been used after four months' service, when the tubular part of the boiler was withdrawn. The result was less favorable than before, the incrustation on the tubes being about three times as thick, though still very thin (1½ millimetres =0.06 inch). Careful examination showed that the feed-water had been better rather than worse than before; but the boiler had 40 per cent. greater heating surface, a grate surface larger in proportion, and evaporated a much larger quantity of water. Moreover in the second experiment the boiler lay by ten days before the water was drawn off.

Further experiments were made with two locomotives, in which previously the formation of incrustation had been such as to produce solid masses between the fire-box sheets and between tubes, entirely preventing the contact of water. After using zinc no trace of incrustation appeared; only on washing out the boiler pasty scales of incrustation were noticeable, as well as a deposit of mud in the lower part of the boiler barrel.

The only disadvantage which manifested as a consequence of the use of zinc was that towards the close of the term of service of the locomotive it foamed easily when working hard.

The last careful experiment was made with the boiler first tried, which had 375 square feet of heating surface. This was begun after it had lain idle four months. About 13¼ lbs. of zinc were first placed on the front of the tubes before they were placed in the boiler barrel in order to bring the metal nearer to the point where the feed-water enters, and an equal quantity was put into the boiler through the safety valve every three weeks thereafter, the boiler first being emptied, washed and filled with fresh water.

When the boiler had been in service from Aug. 14 to Jan. 22—more than five months—the boiler was emptied while not yet quite cold, and the tubular portion drawn out. In the part of the boiler surrounding the tubes (boiler barrel) no adherent incrustation whatever appeared. The whole had settled to the bottom as a yellowish mud. Directly under the safety valve, through which the zinc was introduced, this deposit showed plain traces, and remains of the zinc, partly in the form of particles of zinc not wholly dissolved, but for the most part consisting of a blue-black mud. The zinc which had been placed on the front end of the tubes before they were inserted into the boiler at the beginning of the period of service, retained nearly its original form. It had only become somewhat more porous and flawed, and the easily broken pieces had exactly the same weight as when put into the boiler five months before. This phenomenon was also manifested in the locomotive boilers, and shows that zinc placed too near the steam space in the boiler dissolves with difficulty, while that laid in the lower part of the water is almost perfectly resolved into a mud-like mass. In this case the mass of mud standing in the boiler when somewhat dried, but still moist, measured about 4 cubic feet and weighed 330 lbs.

It was somewhat different with the part of the boiler to which the tubes were attached. Here incrustation on an average 1 millimetre (0.04 inch) thick surrounded the tubes, the total weight being 167 lbs. This incrustation, however, was so loose and soft when the tubes were first drawn out that it could be easily removed in thin sheets with the hand; a few hours later it was so hardened that a steel instrument was necessary to remove it. The mud which had been deposited in the boiler barrel also hardened very quickly in the air. On both sides of the tubes, at the places where the feed-water entered, the incrustation for a distance of 32 inches along them was 1½ to 2 millimetres (0.06 to 0.08 in) thick—thickest in the middle of this length of 32 in. Just here the effect of the zinc was most striking, for before it was used, after a similar period of service and with identically the same feed-water, these places were completely filled with incrustation, so that the spaces between the tubes for a distance of 32 to 40 in. appeared to be completely filled up.

The following conclusions are drawn as the result of these experiments:

1. The effect of zinc in preventing incrustation is so evident that it must be accepted as a fact.
2. It is best to introduce the zinc in small pieces, but the experiments do not indicate how small.
3. The zinc must be placed low down in the water, but not so low as to be covered with the mud which settles.
4. It is well not to keep the boiler in service more than three or four months, and then it should be subjected to a thorough cleaning, which can be easily effected, because nothing but mud will be present.
5. It appears to make no difference whether the proper quantity of zinc for a certain period of service is put in at intervals or all at once, when the boiler is first put into use. (This, however, must be decided by further experiments).
6. It remains undecided whether it is better not to wash out the boiler at all, or as seldom as possible, during its period of service.